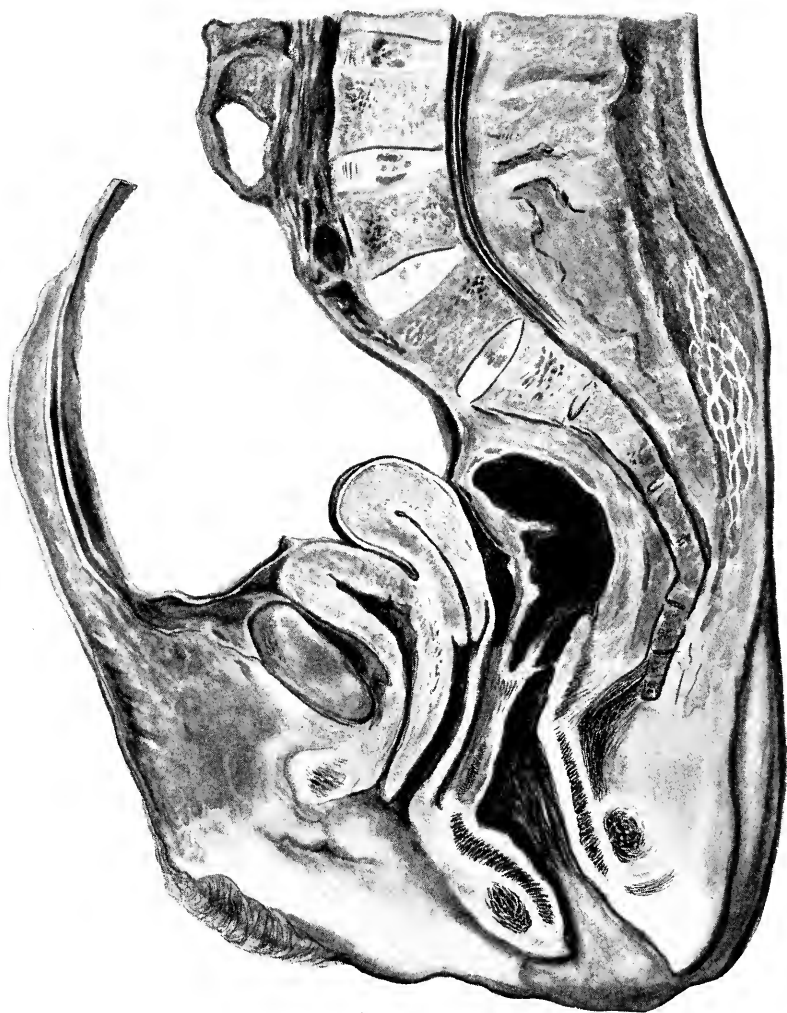PLATE I

Sagittal Section through Child Aged Fourteen Years. (Lynch.)

DISEASES

OF THE

RECTUM AND COLON

AND

THEIR SURGICAL TREATMENT

BY

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ENTEROLOGICAL SOCIETY, NORTHWESTERN MEDICAL
AND SURGICAL SOCIETY, ETC.

ILLUSTRATED WITH 228 ENGRAVINGS AND 9 COLORED PLATES

DEDICATED TO THE MEMORY

OF

James Percival Tuttle, A.M., M.D.

TO WHOSE PIONEER WORK IN PROCTOLOGY MANY ARE INDEBTED,
AND TO WHOM THE WRITER, INDIVIDUALLY, OWES MUCH.

PREFACE.

The present work is not intended to be an encyclopedia or a book for the specialist, though it is hoped that all surgeons who treat this very important class of cases may find interest in its pages. It is addressed more particularly to those practitioners who have not yet attained well-rounded experience in rectal and colonic surgery, and as the needs of each reader will be different, the only way to cover them all is to embrace the entire field. The author has therefore discussed the subject in very full detail. Many matters, apparently trifling, make or mar an operation. These are usually left to the practitioner's resourcefulness when operating. It has seemed far better to prepare him in advance to meet them. The book goes further, for it includes the preparation of the patient, the after-treatment, complications that may occur, and how to overcome them. It also contains cautionary advice as to mishaps to be avoided. Special effort has been made to render the very full series of illustrations as instructive as the text. The steps of operations have been carefully shown.

To Dr. Maxwell-Telling, F.R.C.S., of Leeds, England, I am indebted for the chapter on Diverticula; to Dr. G. Reese Satterlee, of New York, for the chapter on Vaccines; to Dr. Ralph W. Jackson, of Fall River, Massachusetts, for revising the chapter on Cancer; and to Dr. A. Judson Quimby for the chapter on x-rays. My gratitude is also due Mr. Henry C. Lehmann for his incomparable drawings, and for photographs to Mr. Y. Okura and the Studio Deck.

<div align="right">J. M. L.</div>

CONTENTS.

DISEASES OF THE RECTUM AND COLON.

CHAPTER I.

EXAMINATION AND DIAGNOSIS.

THE wreck of homes and happiness; the loss of opportunity both to the patient and the physician; the hopeless invalidism; the prolonged discomforts; the numerous deaths and the many jeopardies in life, not to say the lost reputations of doctors, through failure or delay in the diagnosis of rectal diseases, are scarcely dreamed of by the general practitioner or surgeon; but to the specialist who is daily in contact with these conditions, they are an ol l story more frequent in rectal diseases than in any other, for the simple reason that those maladies, though most amenable to treatment in their early stages, proceed more rapidly than diseases elsewhere, and more frequently become inoperable. Or, if operable, they have proceeded to such destruction of tissue that it is impossible to restore the parts to a normal condition. Such a condition renders prompt and accurate diagnosis more important in these diseases than in any other.

Why this state of affairs has so long been unobserved or neglected by our schools and colleges it is hard to tell; but I venture to say that not one physician in a hundred ever received a single course of lectures on rectal diseases in his entire under-graduate career. Personally we know of but two undergraduate institutions in the United States that have on their teaching staff a man experienced in rectal diseases, or any recognized specialist who gives adequate teaching to the student. There is not a university or medical college of any importance that has a recognized specialist as a professor of proctology. If such a low estimate is placed on this branch of medicine, as a specialty, by

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the teachers of medicine, why should we expect any more of the students when they become practitioners; why should we expect men to examine the rectum when they have never been taught the importance of doing so? Why should we expect men to use a proctoscope when their professors have never thought it necessary?

The rapid progress which has been made in the study of toxemias and autotoxemias, however, has drawn attention to the importance of the large intestine, and especially its lower end, from which so much absorption takes place; and the time has now come when stool examination and proctoscopy will be known to be as important as blood examination and urinalysis. It is important, therefore, that a routine method should be established.

METHODS OF DIAGNOSIS.

There are six different methods to be employed in the diagnosis of rectal diseases—the general physical, the history, the chemical or microscopic, the ocular, the manual, and the instrumental.

General Physical Examination.—Too much importance cannot be placed on a general physical examination in all cases referred to the specialist. A man should be a good physician and surgeon before qualifying as a specialist. If, after a general physical examination, a lesion is discovered, the case should be looked over by an expert to determine the fitness of the patient to withstand an operation. The physician should bear in mind the value of a heart insufficiency on digestion, especially its bearing on stomach, liver, etc., cirrhosis of the liver contra-indicating operation on hemorrhoids.

History.—History taking is of the first importance as a diagnostic aid, and the physician who wishes to succeed must take a complete history of every patient; subsequently adding the details of treatment. It is needless to waste time in urging the advantage of acquaintance with one's patient, and the necessity of permanent and accurate records. To get at the patient's disease, one must understand his attitude toward his own physical condition. Blunt, rough methods, too great haste, and unsympathetic manners often prevent a patient from giving an accurate

and full report of his case and drive him from the examining room. The physician should always give a patient plenty of time at his first visit to tell his story, and give an account of what has preceded the condition for which he is consulting the doctor. A few leading questions may often direct and hasten the story, but one should never shut the patient off too short when he is telling anything that bears upon his disease. Before the story is begun, however, the physician should always get the full name, address, occupation, and habits of the patient. This often saves embarrassment. Dr. Tuttle once had a patient who came to him direct from a very wise and able doctor's office; he was much out of humor, and somewhat justly so, as this doctor had advised him to take long walks, saying that he needed no medicine. The poor fellow was a postman, who tramped the streets from six in the morning to six at night, and could not see that more exercise would benefit him.

This giving the patient time to tell his own story makes him feel at home, and also that you are interested in him; it gives the physician direction for inquiries; it shows the trend of the patient's mind, his mental attitude toward the disease, and often indicates how much of his complaint is actual and how much imaginary. This method may be called subjective examination, and one passes from this to the objective, or direct examination. While we do not attach a great deal of importance to hereditary disease, nevertheless, it sometimes exists, and at once you get both a family and a personal history. We should note the comparative physical and mental conditions; obtain a description of the diseases from which the patient has previously suffered, and an account of the symptoms for which the physician is consulted.

The points to be observed in rectal conditions are: The functional action of the bowels—are they regular or irregular; constipated or diarrheal; are the stools hard or soft; is there straining at defecation; is there more or less frequent desire to defecate without success; is there a feeling of satisfaction after the bowels move, or is there a sensation of insufficient movement, something remaining; is there mucus, blood, or pus with the feces; if so, is it mixed with or coated on the mass; if the stool is diarrheal, is it accompanied with griping, pain, or burning at the anus; are there

free and watery stools, or efforts to defecate resulting only in a discharge of blood and mucus?

Pain.—Pain is the first symptom that brings the patient to the doctor's door.

On account of the abundant nerve supply, any pathological condition of the anus, or sensitive portion of the rectum, causes acute agony, the degree of pain depending on its location and the extent of involvement of the anus, also the susceptibility of the patient. It is, therefore, necessary to have the patient describe the character of his pain; next the location, and its relation to defecation.

Pain occurring during a movement and lasting for some time after is indicative of ulceration of the anus. A throbbing pain is generally suggestive of an abscess. A sense of fulness or a dull aching pain (especially after exercise, or any mental worry), shooting toward the prostate in the male, would suggest hemorrhoids, or congestion around the anus. The pains of hemorrhoids are often mistaken for disease of the prostate. It may also be indicative of some neuralgic condition, following operation, or perhaps due to some congestion. If the pain is situated over the coccyx, and aggravated by pressure or movement of this bone, the symptoms are rather suggestive of a coccygodynia. Pain in the back may be due to a prolapse and impaction, or to a malignant growth. The history of the case will, of course, help to elucidate this problem. When the painful points are situated on either side of the sacrum, almost at its junction with the lumbar vertebræ, it is indicative of intussusception of the sigmoid, especially if associated with a dragging sensation in the left iliac region, and a feeling of heat in the lower portion of the abdomen. A burning pain is suggestive of ulceration or an acid condition of the stools. Pain shooting down the legs and in the lumbar region may mean cancer, or merely ulceration. A sharp pain during a constipated movement, followed by swelling, would suggest a thrombotic hemorrhoid. Pain coming on when walking up stairs, or standing up, is suggestive of a fistula.

Protrusion.—Protrusion may mean a great many things, such as hemorrhoids, polypi, prolapse, hypertrophy, papilla, villous tumor, pedunculated sarcoma, carcinoma, partial or complete

prolapse of the bowel. It is important, therefore, to ask the patient if, when the prolapse occurs, it can be replaced, and if it remains replaced. A tumor, in the patient's opinion, which prolapses and when replaced returns again, is very often either a large thrombotic hemorrhoid, or some external condition. It could be a hemorrhoidal condition, but in that case it would have had to exist a long time before it would prolapse after being replaced. A polypus generally comes down when the patient strains, and when replaced, does not return until some effort is made to expel it again. A prolapse of the rectum, whether partial or complete, may or may not remain in place after it has been put back. A prolapse, however, is always associated with a bearing down pain and a feeling of unfinished defecation.

Discharge.—It is important to find out from the patient the character, the amount, the quality, when it comes, if it is constant or intermittent; if it is mixed with feces, blood, or mucus.

Feces.—It is necessary to inquire into the character of the feces; the amount and consistency; whether the movement is large and well formed or simply rounded and mixed with mucus; the color, whether it is light brown, dark brown, very light, or very dark; the quantity and appearance. There is a prevalent impression that when the feces are tape-like, a stricture exists. To be sure, strictures occur within the first three or four inches of the rectum, and, during straining, the strictured portion of the bowel may be approximated to the anus; in such case the diagnosis of stricture would be correct; but in a majority of cases this condition is associated with a spasmodic condition of the sphincter, which gives the final shape to the fecal matter.

We should also inquire from the patient how many movements he has—whether he has one every day, one every other day, one every three days, one every six days, or one a week.

Hemorrhage.—Hemorrhage is significant of a great many conditions. Blood which is projected with some force, bright red in color, and occurring during a movement would suggest an ulcerative hemorrhoid. A dripping of blood, associated with a movement, may also suggest a hemorrhoid or an ulceration. A little blood on the paper may suggest an ulceration or a fistula. When the blood is dark in color and thoroughly mixed with feces, it may

suggest a malignant growth high up. Hemorrhage may be due to an acute intussusception when it comes on at certain periods and is associated with constipation, and when the symptoms are relieved following hemorrhage. When the blood is associated with mucus and pus, with a frequent desire to move the bowels, it is suggestive of a malignant tumor, a stricture, or severe ulceration. When the feces are slightly streaked with blood, and there is a frequent desire to move the bowels accompanied by diarrhea, our attention will be directed to a polypus in the rectum or sigmoid. An acute hemorrhage may be due to a rupture or to a varicose vein in the rectum or sigmoid; to an injury, a foreign body, or an intussusception.

Itching.—An itching anus, or what we call pruritus, is too often taken for a disease; it is only a symptom and should be looked upon as such. When present, we should note its duration; its precedents (that is, if the patient suffers from hemorrhoids, fistula, constipation, proctitis, gout, rheumatism, or cryptitis), when does it occur, at day or night; after stool; after eating or drinking; is it worse in hot or cold weather; its intensity—whether a discomfort, or an agony driving one to despair. This sounds like a long and tedious examination, but if carried out in routine it can be done in a very short time.

General.—It is not sufficient to confine our questions to subjects relating to the rectum and anus. We must get a general history of the patient's condition, past and present. We must inquire into the condition of the stomach, because certain cases of diarrhea and constipation have their origin in the stomach, and it is impossible to treat such cases intelligently unless we go into the history of the entire digestive apparatus. A diarrhea may be due to an insufficiency of the liver caused by an excess of fatty acids, and unless its origin is investigated we cannot hope to make a correct diagnosis. Insufficiency of the pancreas or of the action of one of its enzymes may be at the bottom of a diarrhea; and a chronic appendicitis may be responsible for a very obstinate constipation. The condition of the heart, lungs, and nervous system should always be taken into account because they have an important bearing on digestion. In both the male and the female the genital organs must be considered, and a

thorough examination made of these organs before eliminating certain factors which are essential to a diagnosis. The worst cases of angulation of the intestines, causing constipation and colitis, are secondary to inflammation in the tubes and other genital organs of the female. A retroverted uterus may account for constipation or diarrhea. An enlarged prostate may have an important bearing on rectal diseases. Abscesses of the prostate

Fig. 1
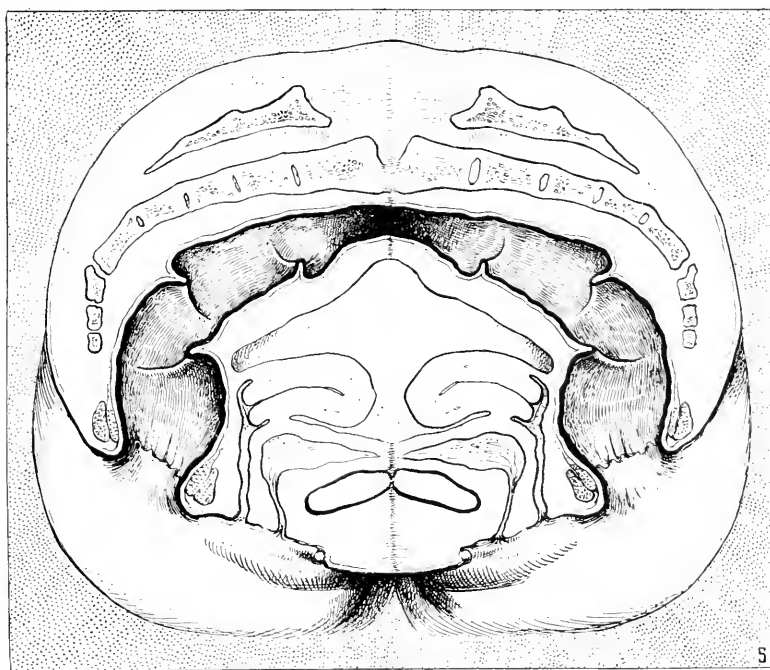
Diagram of rectum and anus for history sheet. (Tuttle.)

result in superior pelvirectal abscesses. Enlargement of the prostate may be the cause of constipation. A severe auto-intoxication may be the result of some slight digestive disturbance, and may have its origin in the mouth, stomach, nervous system, and so on, showing the importance of a thorough examination of all the organs, and not only the rectum and anus.

After having taken the history, one is quite apt to fly to conclusions and arrive at a diagnosis before making the examination.

This is very bad policy, because, sooner or later, it will give the surgeon trouble and he will stultify himself. A surgeon should never arrive at a diagnosis until he has all the facts before him, including the result of a thorough examination, no matter how suggestive the symptoms; for even though the diagnosis is verified by examination, an associated condition may have an important bearing which will be brought out after searching examination. Take a very common condition, like hemorrhoids. In a certain percentage of cases they are only a manifestation, or symptom, of something much worse. They may be the symptom of cirrhosis of the liver, of impaction, stricture, new growth, intussusception, or even more serious conditions.

Chemical or Microscopic Examination.—This is practically examination of the feces, and is laboratory work. It is well, however, for the practitioner to see the natural condition of the stool and how the bowels empty themselves, before giving a laxative or enema. The condition of the stool is important; I have seen such disturbances as backache and leg-ache from constant pressure of hard fecal matter in the folds of Houston, or in the sigmoid flexure. Fecal stasis is one of the causes of backache and one of the frequent causes of tubal and ovarian diseases; and I am sure it is one of the common causes of aching in the perineum and prostate gland, also the cause of autotoxemia. If one washes out the rectum, or gives a large laxative before examination, it is impossible to see whether there is, or is not, fecal stasis. It is better to have a patient come on two successive days than to conclude the examination after having cleansed the bowel. The nature of the stool must be determined in the patient's regular condition. After this it is well to give the patient a laxative or enema and finish the examination.

Local Examination.—I find the left Sims' position to be the most convenient for rectal examinations. In England they prefer the right Sims', and some men in this country have a preference for the knee-chest posture, or the exaggerated lithotomy position. This is entirely a matter of convenience, but to the present writer it seems easier to examine from the right side than from the left.

Physician's Preparation of the Patient for Examination.—Physicians frequently ask us if the patient, before coming for examina-

tion, should not have an enema or cathartic in order to clean the bowels. This would be a mistake since it is only by examining patients under every-day conditions that we can judge of the state of the intestine and see things exactly as they are. For this reason we advise medical men to request their patients not to make any preparation until after the first examination. It may be necessary, after this, to order an enema or laxative in order to explore the sigmoid more thoroughly; but for the first examination the patient should be in his usual condition.

Fig. 2

Position for external examination. (Lynch.)

Inspection.—The patient having been placed in the left Sims' position, the parts should be carefully inspected and any departure from normal noted. The condition of the skin, the absence of panniculus adiposus; whether the skin is normal, thickened, or has a pinkish hue with lanugo hairs, suggesting tuberculosis. The external opening of a fistula, if one exists, should be easily discovered. Fissures, external hemorrhoids, pediculi, and pin worms will be easily seen; you will note whether the skin is thick and moist, or dry; evidence of pruritus should be at once apparent; see if the sphincter is normal, relaxed, or spasmodic; whether there is any evidence of inflammation, or abscess formation, or if thrombotic hemorrhoids exist.

The patient should now be asked to bear down, and the condition of the anus observed. This procedure is often all that is necessary to make the diagnosis; especially in the case of fissure, hemorrhoids, fistula, and hypertrophied papillæ. A polypus with a long pedicle, and situated near the opening, will come down under the efforts of the patient; as will also a prolapse of the rectum, partial or complete.

Fig. 3
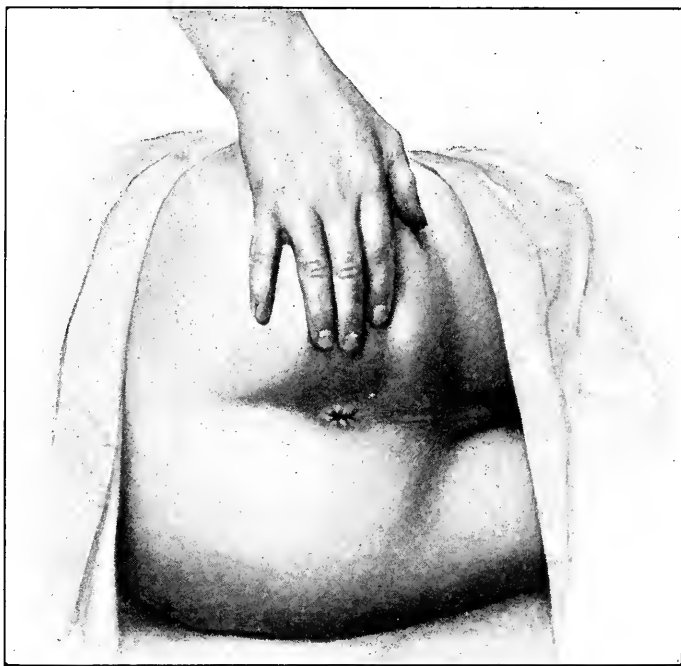
Inspection of anus. (Lynch.)

Palpation.—A great deal can also be learned from palpation. It is often possible by this method to trace a fistula without the aid of a probe; to outline abscesses; and to note painful points, which will perhaps direct us later on to the internal opening of a fistula, the location of a fissure, or the presence of a tumor in the lower rectum. By palpation we get a fair idea of the condition of the sphincter, especially where, owing to the hypersensitiveness

of the patient, a digital examination may be impossible without an anesthetic.

Digital Examination.—To the trained specialist this method of examination is of the utmost importance, and by this simple procedure, especially where the tactile sensation is highly developed, the condition of the anus and lower portion of the rectum can be thoroughly explored and the slightest abnormality can be discovered. Abrasions of the mucous membrane can be readily detected by the trained finger. The introduction of the examining finger has a great deal to do with the influence which the surgeon usually exercises over the patient later on. A man who is very gentle and can make these examinations with a minimum of pain is sure to be regarded highly by the patient; and it is possible, even in the most painful conditions, to introduce the finger and make the examination, with very little, if any, pain. One can determine beforehand where the site of trouble is, and when introducing the finger press in the opposite direction. Before the finger is introduced the nail should be covered with castile soap to prevent injury to the mucous membrane during the examination. It is then well to anoint the finger with some lubricant, preferably lubrichondrine, which is easily removed afterward with soap and warm water. We rarely use vaseline in our practice, as it is dirty, difficult to remove from the hands and instruments, and is ruinous to all forms of rubber. If it is impossible to secure lubrichondrine, or some similar preparation, one can always have castile soap at hand. By slicing it into thin shavings and then pouring boiling water over it, an excellent lubricant is obtained. It should then be placed in collapsible tubes, which can be had in any size at reasonable rates. Kept otherwise, it is impossible to observe anything approaching cleanliness; especially when an open jar is used and the finger passed into it several times a day before examinations.

After the finger has been well lubricated, it is passed in by a gentle boring motion, always away from the painful spot. The finger is passed as far as possible at first, and then gently swept around the rectum. The condition of the prostate is noted.

If, in the female, the cervix uteri is retroverted or enlarged, and pressing on the rectum, it can be felt at this time. We wish

to emphasize the importance of this, because, more than once,
the cervix, when felt through the rectum, has been mistaken for
a new growth, or for stricture of the rectum.

If the uterus is retroverted, or retroflexed, or both, and if
there are any painful points about the ovaries or tubes; or if
these organs are enlarged by tumors or by inflammation, and

Fig. 4

Method of exploring rectum with finger.   (Lynch.)

are adherent to the rectum, they can be readily outlined by the
examining finger. Of course, it may be necessary, in the female,
to make a subsequent vaginal examination, when the condition
of the genital organs can be determined and their relationship
to the rectum noted. At the same time, while the finger is in
the rectum a prolapse, or intussusception of the sigmoid will

readily be made out. Any redundancy of the rectal mucous membrane, hypertrophy of the valves of Houston, the presence or absence of fecal matter, a malignant tumor, stricture, benign growth or any abnormality within reach of the finger can be definitely determined. If the history and indications otherwise point to lesions within the first three and one-half inches, the finger should be gradually withdrawn, and, as it is withdrawn, moved around the circumference of the anus. By pressing the index finger on the coccyx and the left index finger on the outside, this point can be grasped between the two fingers, moved around, and any abnormality of its condition or painful point noticed. Hypertrophied papillæ, abrasions of the mucous membrane, abscesses, the internal opening of a fistula, can all be easily made out by the educated finger. Finally, as the finger is withdrawn, the condition of the sphincter muscle should be determined. If there are any painful points they will contract spasmodically, and a fairly good idea of any departure from the normal can be made out.

Introduction of the Hand for the Purposes of Diagnosis.— In 1872, Simon, of Heidelberg, suggested and carried into effect this method. Since then it has been used from time to time, but is not entirely free from danger, even when the hand of the examiner is within the limits prescribed by Tuttle. Tuttle's dictum is, that no man should attempt this procedure who wears anything larger than a $7\frac{1}{2}$ glove. When this is possible, tumors in the sigmoid, and, indeed, the entire abdomen can be explored, and any pathological conditions readily determined. By means of this procedure, with the left hand on the abdomen, and the patient, of course, under an anesthetic, it is possible to make a very correct diagnosis of pathological lesions of the rectum, sigmoid, and transverse colon. The greatest care, however, should be exercised in making such examination, as deaths have been reported from this procedure, even in the hands of the most competent and careful surgeons. There is a certain limit of shock, we believe, so that the patient's condition should always be under the observation of the examiner, and when any evidence of shock presents, the hand should be withdrawn and the examination adjourned to a subsequent date. We are of the opinion that

it is very much safer to give the patient an anesthetic, and open up the abdomen for exploration, than to depend upon this method.

Instrumental Examination.—The history and development of the proctoscope is very interesting, and it seems strange that
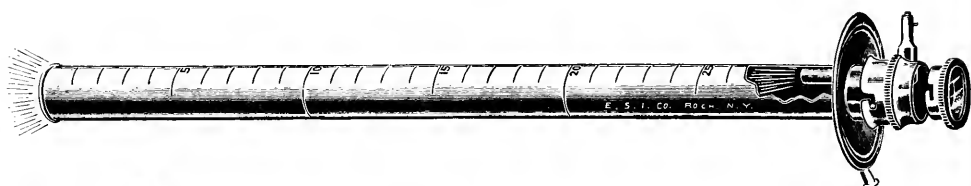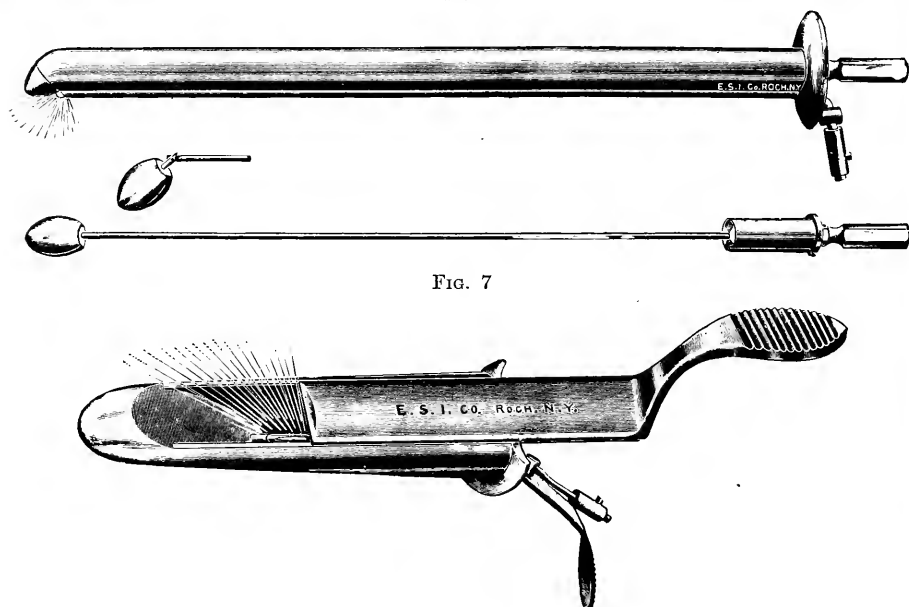
Fig. 5

Fig. 6

Fig. 7

Proctoscopes.

advances in this line were not made at an earlier date. We do not propose to go into historical facts connected with the instrument, as its development is so recent as to be known to all.

The first proctoscope of which we find any record was called the rectal endoscope, and was made by Tiemann, of New York,

in 1870, for Dr. Bodenhamer. Some years after Dr. Kelly, of
Baltimore, devised a set of similar instruments, of unquestionable
usefulness. To Laws, of Hot Springs, Arkansas, we are indebted
for the first electrically lighted instrument for the examination
of the rectum. But his device had several disadvantages, par-
ticularly the necessity of removing the electric light every time

Fig. 8
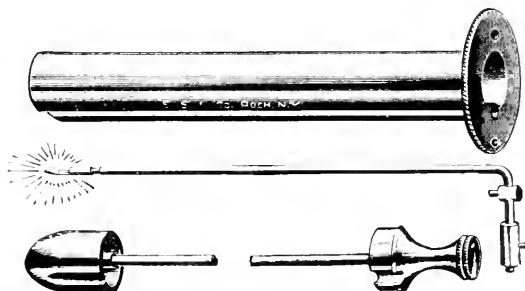
Fig. 9
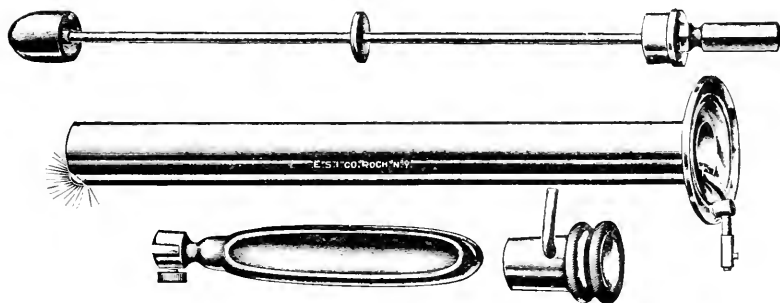
Proctoscopes.

the lamp was soiled. This was a difficult matter. It required
the removal of the glass window at the end of the proctoscope
if air inflation was used.

In 1901 Tuttle modified Laws' idea and perfected the instru-
ment. In the Tuttle proctoscope the light is attached to a carrier
which is passed through an auxiliary tube, separated from the
main tube. The auxiliary tube ends in a glass globe, so that
when the light with carrier is in place, no soiling of the lamp
can occur. If the outside globe is soiled, it can be wiped off
without disturbing the tube.

Numerous attempts have been made to improve on Tuttle's instrument, but, so far as the author knows, no additional advantage has been achieved.

I have demonstrated before the students at Cornell University Medical School the ease with which the proctoscope can be introduced in very young children. One little girl, aged five years, brought by her mother, with some sigmoidal trouble, got on the table, assumed the knee-chest posture, and chatted with her mother during the examination. Another child, aged

Fig. 10
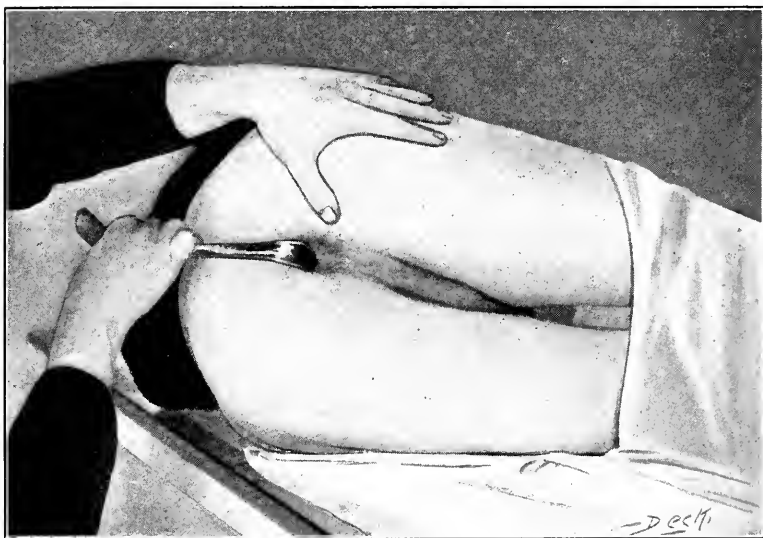
Speculum introduced and sphincter being stretched.   (Lynch.)

twenty-five months, suffering from colitis, was examined easily by the proctoscope. We only mention this to illustrate the possibilities of this instrument. Next to the proctoscope, we find the speculum of Sims, as modified by Gustavus Humphreys, to be the most useful instrument. Flexible silver probes of different sizes are helpful in this line of work. With the tip bent at an angle of 45°, blind internal pockets and diseased crypts can be readily diagnosed.

The following are the instruments which will be found most useful in this line of work:

Proctoscope and Sigmoidoscope.—The accompanying illustrations furnish a good idea of the proctoscope used by the writer. A very small instrument is used in cases of tuberculous strictures, as here it is important to determine how far the stricture exists, and the condition of the mucous membrane above. With this instrument it is quite possible to determine accurately how much should be removed and where to expect healthy mucous membrane.

Fig. 11
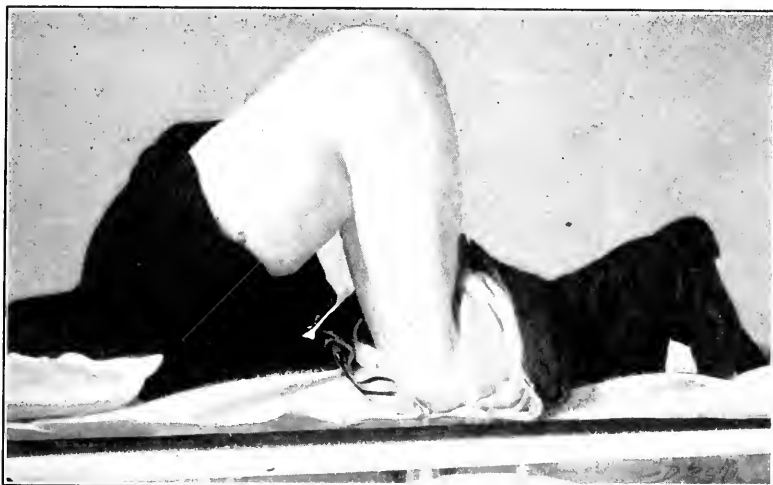
Position for proctoscopic examination. (Lynch.)

Nowadays, nearly every surgeon possesses a proctoscope, but as far as the writer can see, very few know how to pass the instrument with ease. The instrument should be held in the following manner: The auxiliary tube uppermost; the handle of the obturator pressing against the ball of the thumb, index and middle fingers, as illustrated in the photograph. The object of allowing the handle of the obturator to rest against the thumb is to prevent the slipping out of the obturator when the instrument is being passed. The tip of the instrument is now well lubricated; the left index finger is also lubricated; the patient is placed in the knee-chest posture on the table; the left index finger is introduced into the rectum; the patient is asked to bear down and the proctoscope is passed, the tip of the obturator

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resting on the inner surface of the left index finger.   As the instrument is passed in, the auxiliary tube continues to press on this index finger, and as the instrument passes in, the finger is

Fig. 12
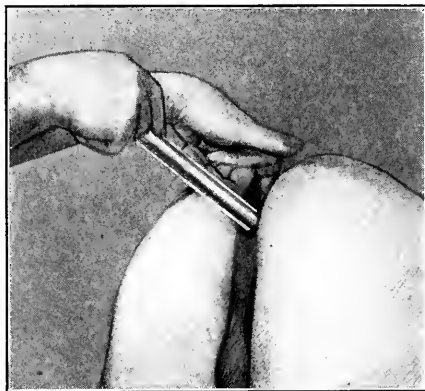
Introducing proctoscope.   (Lynch.)

gradually withdrawn.   The instrument having passed inside the internal sphincter, connections are made between the light carrier and the rheostat.   After the light has been turned on, the

Fig. 13
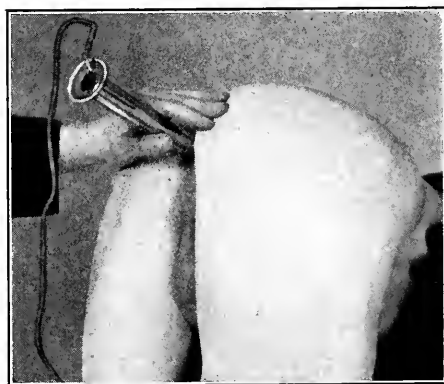
Proctoscope introduced.   (Lynch.)

obturator is withdrawn.   The instrument is now passed entirely by sight, and it is not at all necessary, with a good light, to allow the instrument to injure the membrane in any way.   The plug

and glass window closing the end of the tube, to which an inflating apparatus is attached, can be brought into requisition, and the rectum and sigmoid dilated with air, when the tube can be easily passed. When the rectosigmoidal junction is reached, the sigmoid which adjoins the rectum turns to the right or the left; in our experience, more frequently to the right. At this point difficulty is encountered, even by the most experienced, at times, and if great care is not exercised, it is quite possible to do material damage.

The writer has, on more than one occasion, seen cases of supposed strictures where the surgeon had failed to pass the proctoscope, and found that by a little manipulation it could be passed without difficulty. The reason of this is, that where the sigmoid joins the rectum it forms an acute angle and over this one of Houston's valves will fall, obscuring the direction of the gut from the surgeon. *No force should be used here.* We say this because we know men who have tried to force the proctoscope when they got to this point, imagining that it was some collapse of the bowel and could be passed without trouble, with the result that the mucous membrane was badly damaged. I have seen a swelling of the mucous membrane where it has been pressed against the sacrum by the proctoscope in the endeavor of the surgeon to pass the instrument. This is not necessary. A little manipulation, passing the instrument from side to side, asking the patient to take a deep breath, and inflating occasionally will reveal the direction of the canal, and if a spasmodic condition of O'Byrne's sphincter exists, by waiting until the spasm subsides the instrument can be passed with the greatest ease into the sigmoid. How far the instrument can be passed when it enters the sigmoid depends entirely upon the length of this portion of the bowel. At no time, except where the mesentery of the sigmoid is very short and where very little sigmoid exists, can the instrument be passed above the apex of the sigmoid. If the instrument continues to pass, after this, it is because the sigmoid and mesosigmoid are very long, and this portion of the bowel is pushed before the instrument until, in some cases, it almost reaches the diaphragm. If the patient is put on his back when the instrument has been passed in and after the obturator has

been replaced in the instrument, the tip of the obturator can be felt through the abdominal wall. Some physicians imagine, under these circumstances, that they have passed the instrument into the descending colon, but such is not the case. A good idea of the length of the sigmoid (also the mobility of the sigmoid) can be obtained when the instrument is in this position, by moving the instrument from side to side. In a perfectly healthy sigmoid, where no adhesions exist, it is impossible to make a complete half

FIG. 14
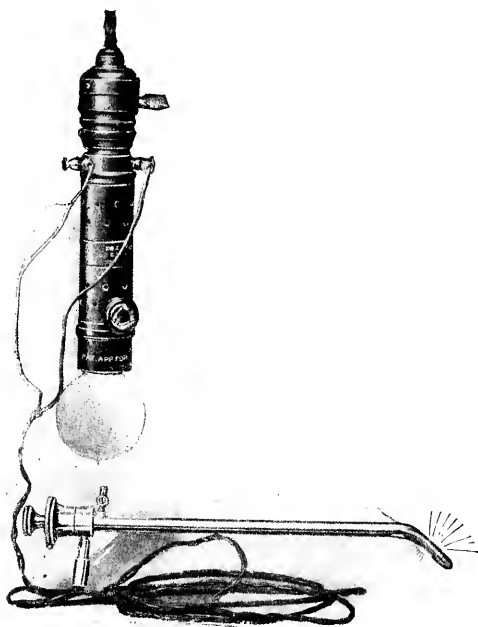
Rheostat for lighting the proctoscope.

circle from right to left. If the adhesions exist it is easy to determine the point where the sigmoid is bound down, because the obturator will indicate the exact location.

I must digress, for a moment, to point out the liability to mistake the mesosigmoid, or a sigmoid with a very short mesentery, for an adhesion, or angulation of this organ. With mesosigmoiditis the mesentery is thickened and the instrument cannot be moved from side to side. Now, if the sigmoid runs in the

direction of the cecum, it is quite possible to get the instrument as far as that organ, and not being able to move it toward the left, one is apt to arrive at the conclusion that adhesions exist between the sigmoid and cecum. Therefore, great caution should be exercised and a thorough examination made of the sacral region; if necessary, an *x*-ray photograph of the sigmoid and cecum can be obtained, which will clear up the diagnosis. The rest of the sigmoid, not reached by the sigmoidoscope, can be outlined by passing the tube which I have devised, namely, the *sigmoidodiaphane*, through the sigmoidoscope into the ascending limb of the sigmoid, connecting the tube with the rheostat, and by transillumination (Fig. 14). To those familiar with the use of the proctoscope, or sigmoidoscope, the slightest abnormality and all gradations between the physiological and pathological can be determined; catarrhal conditions, hypertrophied valves of Houston, ulceration, strictures, new growths, angulations, and so on.

Before the instrument is withdrawn the obturator should be inserted, as otherwise the sphincter grasp on the end of the tube may cause considerable trouble.

CHAPTER II.

PREPARATION OF THE PATIENT FOR OPERATION.

THE preparation of the patient for operation is an important detail; but since the program is similar in all rectal operations (except that it is more elaborate for cancer and stricture cases), it seems wiser to group the suggestions for preliminary treatment, rather than to repeat the technique followed in the discussion of each operation.

Before the advent of the regular profession into this field of surgery, very little attention was paid to the preliminary and subsequent toilet of the patient in operations around the rectum; and as statistics are not available, it is impossible to surmise the mortality in those days. And it is extraordinary with what indifference some surgeons still approach operations in the rectal region. Judging by the preparation one sees before an abscess is opened in any other part of the body, one would think that when it came to operations in the rectum or anus the preparation of the patient would be even more elaborate and the surgeon's vigilance doubled.

J. B. Murphy relates a case where a simple ligature operation was followed by metastatic abscesses throughout the portal circulation. Murphy did not see the case till autopsy; but it illustrates the necessity of careful technique in all operations. We must never allow ourselves to grow careless. It is only by cultivating faultless technique, at all times, that we can hope to avoid errors. A surgeon who allows himself to indulge in slovenly habits, even occasionally, can never count on his results.

In cases of hemorrhoids, fissures, and fistula, the patient is given a cathartic forty-eight hours before operation. This is usually some medicine that he has been in the habit of taking, and has found from experience to agree with him. The physician, however, may prescribe some other drug, with a special object in view; or because his experience warrants him in believing the

drug he prescribes is better for the patient; and, of course, if the patient has no preference, the physician will give the cathartic that in his experience has shown the best results. Our choice lies between castor oil, or some of its congeners, and a saline. The last drug is contra-indicated in fissures and ulcerations around the anus. At the same time the patient is instructed, if not in the hospital, to take a saline enema two or three times a day; these are kept up until a few hours before the operation. These instructions will be carried out by an orderly if the patient is in the hospital.

The first question that arises in connection with the preparation of the patient is when he should enter the hospital. It depends a great deal on the idiosyncrasies of the patient. It would be an error of judgment to insist on sending to the hospital a man who is exceedingly nervous, or one who is made nervous by the hospital atmosphere, several days before the operation, when the routine can be accomplished at home. On the other hand, there are individuals who are perfectly contented in a hospital and who would rather go there for a few days beforehand than have the preparation elsewhere. From our experience, however, we believe the latter are in the minority. "*Hospitalitis*" is acquired after, rather than before, the operation.

We have found that the test diet as prescribed by Schmidt suits all cases (see Chapter on Diet). It is easily digested, leaves very little residue, and reduces gas, all of which contributes to the patient's comfort. However, there are some healthy individuals who object to being put on such an unsavory and limited diet. In these cases it is our custom to prescribe a simple substitute.

The night before operation the patient is given a bath. Afterwards the parts are shaved and washed off with a tincture of green soap and water, and then a piece of sterile gauze is saturated with a 50 per cent. solution of alcohol and applied to the buttocks. This is allowed to remain in place until the next morning. When the patient is under the anesthetic the parts are washed off, first with ether, then alcohol, and the sphincter dilated. After this the bowels are washed out with pure peroxide of hydrogen and then with normal saline solution. When the necessity arises we follow this by swabbing out the rectum with alcohol, 95 per cent.

In cancer and stricture cases, where a radical operation is intended, we insist upon the patient having from four to seven days' preparation before operation. Where patients are put on the Schmidt diet, the principal part of the preparation consists of washing out the bowel three times daily with a pint of 2 per cent. peroxide of hydrogen. The three days preceding operation a saline irrigation is given once daily. The bowels are confined by giving the patient some 15 minims of deodorized tincture of opium three times a day. The night before operation the patient is given a bath, and the buttocks are scrubbed with tincture of green soap and water, followed by the usual application of a piece of gauze saturated with 50 per cent. alcohol.

In case of abdominal operation we give the patient the usual bath, wash the abdomen with tincture of green soap and water, and put on a sterile dressing. As soon as the skin is dry, we paint the abdomen with tincture of iodine and then cover the parts with a sterile dressing. We have adopted this procedure in all our abdominal cases for over two years and the results are most satisfactory.

CHAPTER III.

ANESTHESIA.

BEFORE the days of the specialist in anesthesia, no matter how expert the surgeon, his success was more or less at the mercy of the recent college graduate or undergraduate who secured a hospital appointment and came into the operating room as an anesthetist, without any preliminary study of the art, and without any knowledge of the influence of the different anesthetics upon the human system. He had heard that chloroform was more dangerous than ether. But that ether could not be administered recklessly, or in careless quantity, did not always occur to him.

Now the day of the specialist has come; and with it the trained anesthetist, making incalculably happier the surgeon's lot. Nevertheless, the surgeon having studied his patient, and understanding his condition as the anesthetist cannot, should use his own judgment in the choice of the anesthetic to be given. Even in the hands of the most experienced, accidents will happen; but these may be lessened if the surgeon chooses the anesthetic with care.

The essential points to be considered in anesthesia are: (1) Safety, (2) efficiency, and (3) a minimum of after-complications. Therefore, any method of anesthesia which combines these qualities must, of necessity, be of infinite value and have a definite advantage over all other means of anesthesia thus far employed.

Intraspinal Anesthesia.—Intraspinal anesthesia is fraught with considerable danger to the patient, and can be applied only by those who have had a very wide experience. Even in the hands of the skilful accidents happen on account of some slight disturbance of the spinal or medullary centres. For instance, a certain increase of pressure, even the slightest, has been shown by Herter to be exceedingly dangerous because of the mechanical effect of the increase in the spinal pressure, causing cessation of respiration quickly followed by cardiac inhibition and a sudden

fall in blood-pressure. There is also the danger of infection to be considered. For these reasons spinal anesthesia has a very limited field of usefulness. Indeed, one is hardly ever justified in using spinal anesthesia in rectal work, the one exception being cancer, because, after all, the risk from this method is not proportionate to the gravity of the case.

Intravenous Local Anesthesia.—Beer's technique, while of unquestioned value when it can be adopted, will not be considered here, as it is not applicable to rectal surgery.

Morphine and Hyoscine Anesthesia.—A continuous ether or chloroform anesthesia often causes changes in the liver and kidney cells, and so influences their functions as to permit the passage of toxic substances through those organs without being neutralized before entering the general circulation, resulting in toxemia and death several days after the operation.

Realizing this, it is important that some method of shortening the anesthesia be employed; that the intake of chloroform or ether be lessened by giving the patient some less objectionable or less toxic drug, or by some preceding anesthetic less hazardous. We now use hyoscine and morphine, either as a substitute for or preliminary to general anesthesia, in selected cases, in the following manner: Some two or three hours before the time of the operation, the patient is given $\frac{1}{100}$ grain of hyoscine. If one hour before the operation the patient is still awake, the dose is repeated, with $\frac{1}{6}$ to $\frac{1}{4}$ of a grain of morphine. Should he, however, although awake, be very drowsy, the hyoscine is repeated—but without the morphine. In cases where the patient is known to be addicted to morphine, or for some other reason is known to be insusceptible to the drug, we add $\frac{1}{8}$ to $\frac{1}{4}$ of a grain of morphine to the first injection of hyoscine.

This method has been very satisfactory, both on account of the fact that it has enabled us to do major operations covering several hours with a few drams of chloroform and a proportionate amount of ether, if not quite eliminating, at least greatly minimizing the danger from postoperative hepatic toxemia; and from the fact that shock, and that nightmare to all patients, the pre-anesthetic period, are both done away with; also, owing to dryness of the mouth and absence of saliva during the operation, postoperative pneumonia seldom occurs.

It is very important, however, that great caution be observed in the use of hyoscine and morphine, for grave results follow its injudicious use.

In all cases the drug should be given two or three hours before the operation, and in small doses. By following this rule, and by never allowing the drug to be administered except under your own supervision, or that of your trained assistant, the danger will be infinitesimal.

It is true that almost all new anesthetics suffer in reputation, either because experimenters use them injudiciously or because those who commercially exploit them fail to point out the dangers as well as the benefits of their drugs; hyoscine is too valuable a remedy to thus fall into ill repute.

Omnopon.—Omnopon, as it is termed in England, or *pantopon*, as it is called on the Continent, is now being used with great success by surgeons all over the world. It was first introduced by Prof. Sahli, of Berne. It is sold both as a liquid and as a powder, but the liquid form has been found the more useful. Drs. Gray and Anderson, of Aberdeen, after having used it in several hundred cases, speak very highly in its favor.

The dose for an adult male is about two-thirds of a grain (0.04 gram) in combination with hyoscine. The technique and the time of injection are similar to those described under morphine and hyoscine anesthesia. It is particularly useful as an adjuvant in sacral anesthesia. Indeed, it has the same field of usefulness as the morphine and hyoscine injections. As a preventive of shock it is more potent than morphine when administered to the aged. It does not cause postoperative intestinal paralysis, as does morphine. Complications, or by-effects, which have been noticed, are as follows: Occasionally nausea and vomiting, especially when omnopon is used alone; dryness of the mouth, increase of the pulse rate for several days afterward, slowing of the respiration, and some reduction in the output of urine, also mental dulness for ten or twelve hours afterward. All these by-effects have been observed after morphine and hyoscine; but pantopon has the one great advantage of not interfering with peristalsis as much as morphine.

Ethyl Chloride.—Ethyl chloride had numerous ill-starred experiences. Innumerable imitations came on the market, and every medical fledgling devised a new mask, which he hastened to use, regardless of consequences. The result was that men of standing and experience, who should have been the first to embrace its use, were the last to test it.

The writer was the first to advocate the drop method in its use, as recorded in a paper Dr. Tuttle read before the New York County Medical Society. It is found that by the drop method the drug can be used more discriminatingly and that much less of the anesthetic is required. Another advantage in this procedure is that it does not crystallize all over the mask, as it does in the spray method.

Do not understand us to advocate this anesthetic to the exclusion of ether or chloroform; that would be absurd; but we do hold that for examinations, short operations, as a preliminary anesthetic to ether or chloroform, and as an adjuvant to hyoscine and morphine, it is safer and more efficacious than any other anesthetic in use today.

We are also firm believers in the open method of administering all anesthetics, and are decidedly opposed to any form of closed inhaler. To the open method we must attribute our good results with ethyl chloride.

Ethyl chloride alone is not suitable for any anesthesia which must last over ten minutes, as vomiting is apt to follow a prolonged use of this drug. It is also contra-indicated in alcoholics, in children with adenoids, and in patients suffering from acutely inflamed condition of the throat or with advanced cardiac disease.

Spasm of the larynx has occurred in some 5 per cent. of our cases; but this is at once relieved by withdrawing the anesthetic, or by substituting a few drops of chloroform.

It must be admitted that our method of administering the anesthetic is more wasteful than with the mask; but since, by this procedure the risk to the patient is so much reduced, the question of expense is unimportant.

Nitrous Oxide.—Another anesthetic that has been much overlooked, and one that is particularly safe, is nitrous oxide, either alone or with oxygen. I think that prejudice has much

to do with its neglect. Those who condemn it are usually those who have used it but once, and abandoned it because of the rigidity and cyanosis. But this is not the way to get results. Here we have something absolutely safe, and we should exercise a little patience in giving it a fair test. In our opinion, the surgeon would get better results and the anesthetist gain confidence if the anesthetic were not rushed in the beginning.

The anesthetist should take plenty of time; the patient should be allowed to get used to the anesthetic and to accommodate himself to his surroundings. The patient will be less frightened, then; it takes less of the anesthetic to put him under, and he comes out in good condition. There is nothing to be gained by crowding the anesthetic, and under no circumstances should the patient be restrained in the early stages of anesthesia.

Nitrous oxide, alone, is not suitable in all cases, and is not well adapted to operations around the rectum on account of the straining and cyanosis; but this is materially lessened by the addition of oxygen.

For alcoholics, or very vigorous individuals, it is not recommended, unless the patient will pay the extra cost, the quantity required in such cases being quite an item.

The writer has performed many "Whitehead" and abdominal operations under nitrous oxide gas and oxygen, and found the combination eminently satisfactory.

The apparatus necessary for nitrous oxide anesthesia is cumbersome, however, and it can hardly be recommended for operations performed outside of an institution.

Delayed chloroform poisoning was first described by Guthrie in 1894. He drew attention to the following chain of symptoms: Profuse and repeated vomiting, eventually bloodstained and resembling dregs of beef tea (Hunter); restlessness and excitement; delirium alternating with periods of apathy; jaundice occasionally, and unconsciousness deepening into coma. Since then this condition has been investigated by a number of scientists, who have been able to produce the same condition in animals. The consensus of opinion is that an insufficient liver is incapacitated by the anesthetic and the result may be toxemia or death. From a

clinical study of a number of cases we are inclined to think that intestinal auto-intoxication is the most important predisposing cause of delayed chloroform poisoning. The urine should be examined, and a nitrogen and sulphate partition made, before administering an anesthetic in cases in which disease is suspected. Furthermore, these patients should be put on a carbohydrate diet some days before operation and given blanc mañge three hours before taking an anesthetic. The anesthetic should be cautiously administered or entirely withdrawn when the surgeon is dilating the sphincter muscle, otherwise serious consequences are apt to follow during the deep expiration caused by stimulation of the respiratory centre when dilatation is being instituted.

The choice of an anesthetic is important, but even more so is the choice of the man who administers it. No one should be allowed to give an anesthetic, alone, until he has been proved competent. If you know the hospital anesthetist is not competent, do not risk your patient in his hands. If the patient cannot afford to pay a specialist, content yourself with a smaller fee and pay the anesthetist yourself, rather than risk unhappy results. It is worth the price. Having a competent anesthetist, you need give no thought to that part of the work, but devote all your energies to the absorbing task before you. You also have less to worry about afterward if your patient comes out of the anesthetic well and has no bad effects from the anesthesia to contend with, in addition to the wound and shock.

Above all, you want an anesthetist who is competent in an emergency. The man who knows what to do when anything goes wrong, and does it, is the man who is worth his fee. There is no time for cogitation when a patient's heart stops beating; but there is hope for the patient and success for you if your anesthetist can prove himself efficient in an emergency.

Local Anesthesia.—In 1902, Dr. Réclus, of Paris, first suggested and performed the operation for dilatation of the sphincter, by injecting a strong solution into various parts of the sphincter muscles; but with only indifferent success. Since then the technique has been perfected and the method is now used extensively, not only in rectal diseases, but as a substitute for general anesthesia in major and minor operations in other parts of the

body; it has probably found its greatest field of usefulness in herniotomy. We have held, since the inception of this method of anesthesia, that its field of usefulness is limited so far as rectal diseases are concerned. We deem it wise to point out, in this chapter, its limitations. In adopting local anesthesia many will have met with disappointment from faith in the too roseate view of the authors; and others may have been discouraged from the pessimistic reports of those who have not had the happiest of results. Between these two extremes lies the truth.

First of all, let it be remarked that what the surgeon terms "painless," and what the patient terms "painless" are not always identical. "Practically painless" would be a better expression. But, however slight the discomfort during an operation, postoperative pain in rectal surgery is unavoidable, whatever the anesthetic employed, unless prevented by opium or some other anodyne.

There is no doubt that in many cases local anesthesia is a godsend. For the patient who, because of his condition or through apprehension, cannot take a general anesthetic, it is a boon. But there are also cases where the result is most unsatisfactory, and the procedure is painful.

In the first place, the character of the operation must be considered. Secondly, the patient's temperament, *i. e.*, whether he is phlegmatic or nervous, and whether or not he is mentally equipped to bear an operation while conscious. With a person who is moderately calm and courageous, the following operations have proved entirely feasible under local anesthesia: Dilatation for fissure; for external, internal, and thrombotic hemorrhoids; for polypi; and for certain types of fistula.

Dilatation can be performed with less pain and discomfort if the following technique is adopted. The important point to remember is that the sensory nerves are the inferior hemorrhoidal and the lesser sphincterial. The inferior hemorrhoidal is sometimes derived from the pudic, from beneath the sacrosciatic ligament; but it is often derived from the sacral plexus direct. It enters the sphincter in the shape of a fan. It is not spread out as is sometimes supposed, but enters the muscle in the long axis of the anus.

There is hardly a case of fissure that cannot be operated upon with satisfaction; the patient being relieved with a minimum of pain and detention.

On the other hand, fistulæ, except those that are of the straight, submucous type, and those opening anteriorly—which are generally free from complications—are not suitable for local anesthesia.

Fig. 15
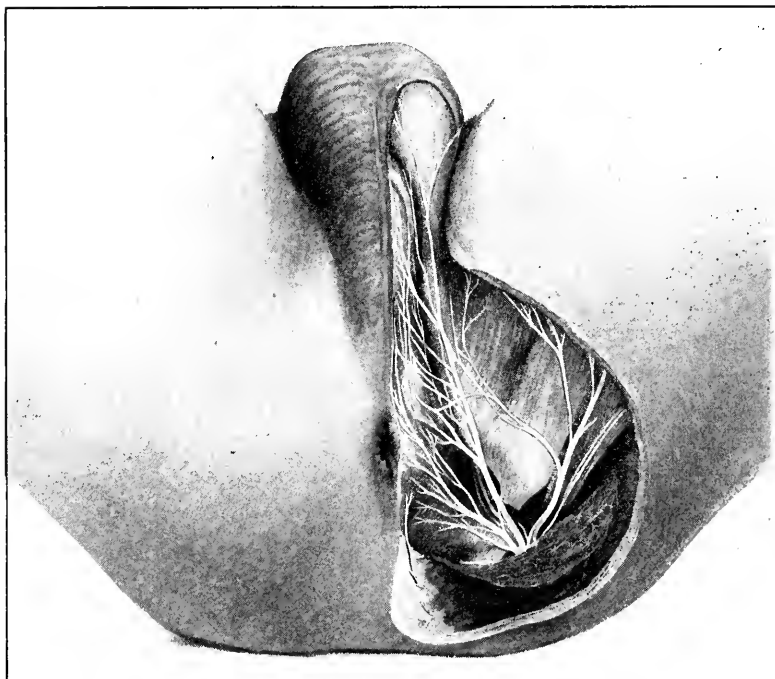
Showing the nerve supply to the anus.   (Lynch.)

The writer, who has operated on fistulæ of every type, after several unsatisfactory experiences with local anesthesia in this field, unhesitatingly commends, for this class of operation, the general anesthetic; with the exceptions noted above.

External hemorrhoids, skin tabs, and similar conditions, can be satisfactorily operated upon with injections of either sterile water, or very weak cocaine solution; but these are the only conditions under which sterile water anesthesia may be properly employed.   In the case of internal hemorrhoids this is impossible,

because in loose tissue pressure on the nerve endings is lost. The following solutions have been tried in the hospitals and found satisfactory: Sterile water, magnesium sulphate, salt solution, beta-eucaine, and stovaine; but we are inclined to believe that in novocaine and hemesia we have the most reliable anesthetic.

The injection of sterile water is painful, no matter how carefully it is injected. Even when administered drop by drop the patient suffers acutely. It is not isotonic with the interstitial fluids of the body, and is therefore most irritating.

Urea and Quinine.—The author's experience with urea and quinine is not extensive, as unfavorable reports from other surgeons inclined him to be cautious in its use; but it must be said in its favor that it is a lasting anesthetic, and in the writer's limited experience has proved very reliable. It also has the advantage of not being toxic. Its great disadvantage is that it causes a great deal of pain during injections; but this may be overcome, I find, by injecting, previously, a little cocaine or novocaine. It must be remembered that it is of the utmost importance that a patient should suffer no pain during the injection of an anesthetic. It completely demoralizes him, and he has neither respect for you nor confidence in you, if, after promising him a painless operation, you immediately subject him to acute agony. No matter what you may do afterward, the patient is bound to be restless, rigid, and on the lookout for trouble; and it is needless to say that under these circumstances the surgeon will not do good work. Good work is the surgeon's best asset, and it is unwise for him to jeopardize his reputation for the sake of a fee, or to compete with quacks; so if the operation will not be painless do not make the foolish mistake of promising an operation without pain.

Hemesia, which contains besides quinine and urea $\frac{1}{15}$ grain of chloral, after the formula of Carlton Smith, promises good results; but we must withhold judgment until further trial has been made. So far we find it satisfactory; but experience has taught us that often a new anesthetic has the luck of a novice in a game, while later on the results may not be so pleasing.

A few maxims, before we go on:

1. It is most important that a patient, awake during an opera-

4

tion, should be made as comfortable as possible, a pillow here or
there; some slight change of position may make or mar your
success.   Under the most favorable circumstances the patient
is nervous and upset, and if he has the tension of discomfort to
endure, besides his dread of the knife, he will not bear the ordeal
well.

2. Make no promise which you cannot keep. A plain statement
of fact is always the best. Tell the patient he must expect some
pain. Then, if you are so fortunate as to cause him none, you
have his gratitude; and should pain result he has been warned
beforehand, and it is no more than he expects. The insertion of
the needle through the skin is often the index of success or failure,
and to secure success you should start by anesthetizing the skin
with carbolic acid and ethyl chloride before you pass the needle.

And do not imagine that because the parts are anesthetized
that they may be roughly handled. The same gentleness should
be observed when operating under local anesthesia as when
examining a patient on the table, since infections, and some
shock, have resulted from rough handling.

Thrombotic hemorrhoids are particularly amenable to a local
anesthetic. They can be incised, and the clot, or clots, turned
out without undue pain. If there is a redundancy of skin, however,
we find it better to excise a hemorrhoid, as the inflammatory
edema following may otherwise cause more discomfort than the
original condition.

Internal hemorrhoids can be removed with very little incon-
venience to the patient, except when they are very small and do
not prolapse, and the patient has a funnel-shaped anus. In such
cases it is difficult to operate under local anesthesia, and here I
prefer to use ethyl chloride, or ethyl chloride and chloroform.
I have used these anesthetics over two hundred times, and
consider them, next to cocaine, the most valuable for short
operations.

Sometimes we are at a loss to account for the recurrence of
internal hemorrhoids, shortly after they have been removed under
local anesthesia; but the explanation is that too much of the
solution was used and the hemorrhoidal veins were left. How
does this happen? In the first place a quantity of the solution

sufficient to cause considerable distension of the hemorrhoid is injected beneath the mucous membrane; as a consequence, the mucous membrane and veins are separated, and when we come to remove what appears to be hemorrhoidal tissue, we remove only mucous membrane. To obviate this, the solution should be injected slowly, and only a small quantity at a time. We must remember that it takes a little time for the cocaine to act. Inject as little of the solution as is consistent with painless removal.

Polypi, if in the sensitive area, can be treated in the same manner as hemorrhoids; if beyond this zone, no anesthetic is necessary. Six polypi were removed from a boy, aged seven years, by the writer, at one sitting, the patient suffering no pain except from the introduction of the proctoscope, which is always disagreeable when first employed.

A hypodermic needle about two inches in length is used; and a sterile solution of 0.2 per cent. cocaine or eucaine. I prefer cocaine, freshly made, because it is always reliable. The needle is introduced in the median line about one-half inch back of the posterior commissure of the anus; a drop or two of the solution is injected into the subcutaneous tissue; the right index finger is then introduced into the rectum and hooked around the internal sphincter, thus dragging it down into apposition with the external; the needle is then carried upward and forward into the sphincters, one after the other, depositing about 5 minims of the solution in each muscle at a point about one-half inch in front of the posterior commissure; the needle is then easily withdrawn and introduced in a like manner into the muscle on the opposite side of the posterior commissure; 20 or 30 minims of the solution are used. After some two or three minutes a duck-bill speculum is introduced into the anterior commissure of the rectum and, with this as the point of resistance, the sphincters are gently massaged and stretched to any desirable extent.

We have burned rectal strictures of the valvular type with the cautery, before the class at the Polyclinic, and the patient experienced no pain. This I mention as proof that above the area mentioned local anesthesia is not required. I have also done the Whitehead operation under cocaine; but I do not advocate local anesthesia for so extensive an operation.

Some authorities advise extirpation of epitheliomata and carcinomata that are low down, under local anesthesia; but to this I demur. I believe, with other conservative surgeons, that such conditions, no matter how circumscribed, require radical measures and therefore belong to the domain of general anesthesia.

Fig. 16
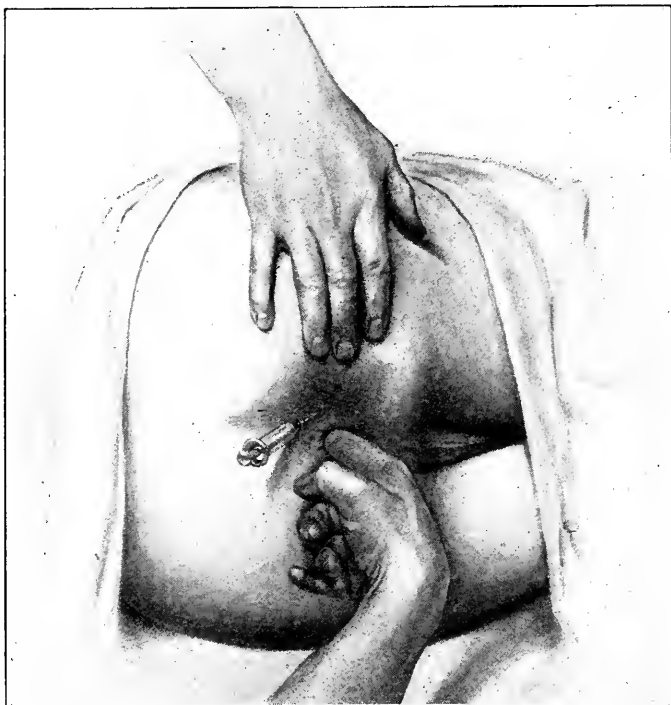
Introducing the needle for local anesthesia.   (Lynch.)

We have given here what we consider a conservative view of local anesthesia. With three large clinics and our private practice to draw upon, we have tested it extensively, and feel we can speak authoritatively as to its place in rectal work.

Men who promise—and try—to operate on any and all rectal conditions under local anesthesia, are either inexperienced or indifferent to results.
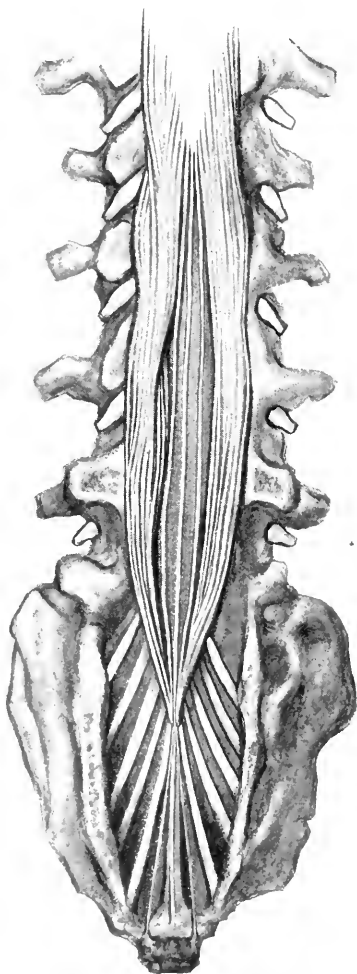
To the man who selects his cases intelligently, however, local anesthesia must prove a valuable aid.

Extradural Anesthesia; Sacral Anesthesia.—The procedure which we are about to describe is absolutely free from danger, gives a perfect anesthesia, prevents shock, and allows of any surgical procedure below the cul-de-sac of Douglas. It can be used in any of the following procedures: Cystoscopy, operations on the urethra, prostate, perineum, rectum, and lower extremities.

Before describing sacral anesthesia, a brief outline of anatomical conditions is necessary.

The spinal cord (medulla spinalis) is that part of the central nervous system, or cerebrospinal axis, which lies within the vertebral canal. Its upper limit, where it becomes continuous with the medulla oblongata, is in a measure conventional, since there is no demarcation on the cord itself to indicate exactly its junction with the brain. Accurately considered, the superior limit of the cord may be assumed to correspond with the emergence of the uppermost root-fibers of the first spinal nerve which pass out between the atlas and the skull; this level also corresponds to the lowest strands of the pyramid decussation of the medulla

FIG. 17

Spinal cord with dura removed.
(Lynch.)

oblongata and to the upper border of the posterior arch of the atlas. For practical purposes, however, the lower margin of the foramen magnum defines with sufficient accuracy the upper limit of the spinal cord. Below, the spinal cord terminates

somewhat abruptly in a pointed end, the conus medullaris, that usually ends opposite the disk between the first and second lumbar vertebræ. The level to which the cord extends inferiorly, however, is subject to considerable variation, very rarely being as high as the middle of the body of the last thoracic vertebra (Moorhead) or as low as the upper border of the body of the third lumbar vertebra (Waring). In the female subject the spinal cord, although absolutely shorter than in the male, extends to a relatively lower level in the vertebral canal. Marked bending of the spine produces slight alterations in the position of the cord, during strong flexion an appreciable ascent of the lower end taking place. The relation of the cord to the vertebral canal varies at different periods. Until the third month of fetal life the cord occupies the entire length of the canal, but subsequently, owing to the more rapid lengthening of the spine than of the spinal cord, the latter no longer reaches to the lower limit of the canal, and, therefore, apparently rises, so that by the sixth month of fetal life the lower end of the cord lies opposite the first sacral vertebra, and at birth terminates usually on a level with the body of the third lumbar vertebra.

The Membranes of the Cord.—The spinal cord, together with the roots of the thirty-one pairs of spinal nerves, lies within the vertebral canal enclosed by three protecting membranes, or meninges, which, from without inward, are (1) the dura mater, (2) the arachnoidea, and (3) the pia mater, all of which are directly continuous through the foramen magnum with the corresponding coverings of the brain. The external sheath, or theca, formed by the dura, is a robust fibro-elastic tubular envelope, much longer and considerably wider than the cord, that does not lie against the wall of the vertebra canal, but is separated by an interval containing thin-walled plexiform veins and loose fatty connective tissues.

The dural sheath, about 0.5 mm. in thickness, extends to the level of the second sacral vertebra and is, therefore, considerably longer than the spinal cord. The part of the sac not occupied by the cord encloses the longitudinal bundles of root-fibers, that pass obliquely to the levels at which the corresponding nerves leave the vertebral canal, and a fibrous strand, the filum terminale, prolonged from the cord to the lower end of the spine.

The pia constitutes the immediate investment of the cord, and supports the bloodvessels destined for the nutrition of the enclosed nervous cylinder. The pial sheath is composed of an outer fibrous and an inner vascular layer, the connective tissue of the latter accompanying the bloodvessels into the substance of the cord.

The arachnoid, a delicate veil-like structure made up of interlacing bundles of fibro-elastic tissues, lies between the other two membranes and invests loosely the inner surface of the dura and closely the outer surface of the pia. It effectually subdivides the considerable space between the external and internal sheaths into two compartments, the one beneath the dura, the subdural space, being little more than a capillary cleft filled with modified lymph, and the other, the subarachnoid space, between the arachnoid and the pia, containing the cerebrospinal fluid. The spinal cord, therefore, hangs suspended within the tube of dura, surrounded by a cushion of fluid—an arrangement well adapted to insure the nervous cylinder against the injurious effects of shocks and of undue pressure during changes in the position of the spine. Both spaces, but particularly the subarachnoid, are crossed by fibrous trabeculæ and thus imperfectly subdivided into secondary compartments, all of which are lined with endothelium.

We have examined a number of cadavers, and taken measurements at different points to establish, if possible, a fairly accurate method by which the opening into the canal can be located. At first measurements were taken from the posterior-superior spine of the ilium to the tuberosity of the ischium on both sides, but the bisection of these lines did not come anywhere near the opening. The next measurements were taken from the posterior-superior spine of the ilium to the left margin of the sacrococcygeal joint, and the same on the other side, and we found the opening of the canal in most cases to be where these two lines bisect.

In the majority of cases, the spine of the sacrum is bifid, and does not reach within an inch of the sacrococcygeal joint. Under such circumstances, the insertion of the needle is a comparatively easy matter. In other cases, the opening is close to the sacrococcygeal joint, and the safest plan to follow then is to find this

joint and insert the needle at this point, then, closely following the bone, the needle is bound to enter the sacral canal. One can easily tell when the needle has entered the sacral canal by moving it back and forth, when, if it is in the canal, the bony structure will be felt, and if it is not in the canal, it will readily be felt under the skin. Of course, in very fat subjects it is possible to make an error, but even under these circumstances it can be demonstrated that the needle is in the canal by bending the outer portion of the needle inward, and trying to pass the point through the skin. If the needle is under the skin, it will pass out, and if it is in the canal, it cannot pass out.

FIG. 18
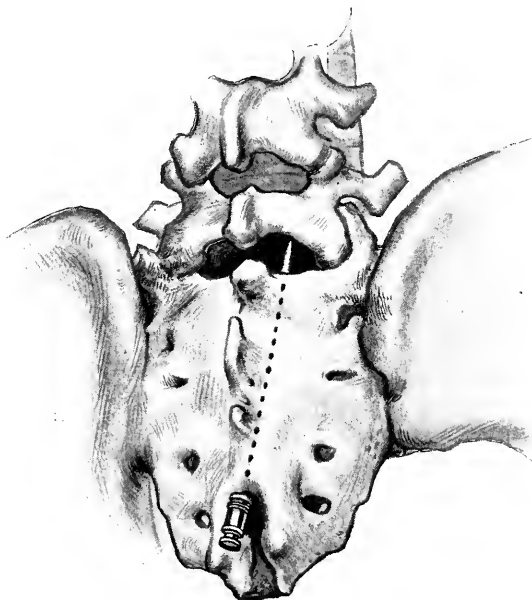
Sacrum and ilium, showing needle in the canal.   (Lynch.)

If the needle is very long and it is passed to one side, it is quite possible to pass it through the skin above the crest of the ilium.

The safest method to adopt, especially by those who are not very familiar with this procedure, is to make an incision a little in front of the sacrococcygeal joint, and, if necessary, extend it until an opening is found. This can be done under local anesthesia.

The point at which the needle is to be inserted is first decided upon. This can be determined by following the sacral spinous processes until they are found lacking. Slightly above this point will be found the opening of the canal. If, as happens in

FIG. 19
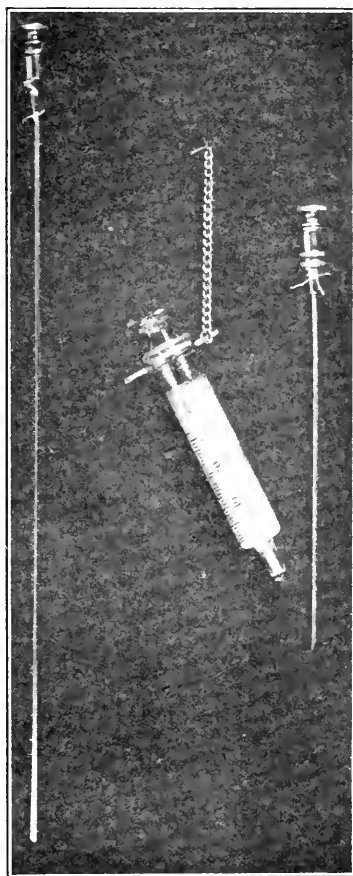
Instruments used in sacral anesthesia. Needles and syringe.

most cases, we have a bifid spine, the ridges can easily be felt, except, as I have said, in very fat subjects. If the canal opens near the sacrococcygeal joint, this point is selected. Then, having first determined the point at which the needle is to be inserted, and this is always in the median line, it is painted with tincture

of iodine. Next, a little ethyl chloride is sprayed on the skin, and a hypodermic syringe, containing a solution of 1 to 500 cocaine, with an ordinary hypodermic needle is employed in order to anesthetize the skin over the area in which the needle is to be inserted, so that a small incision can be made without causing any pain. It is always better to incise the skin in order to obviate any chance of infection.

Fig. 20
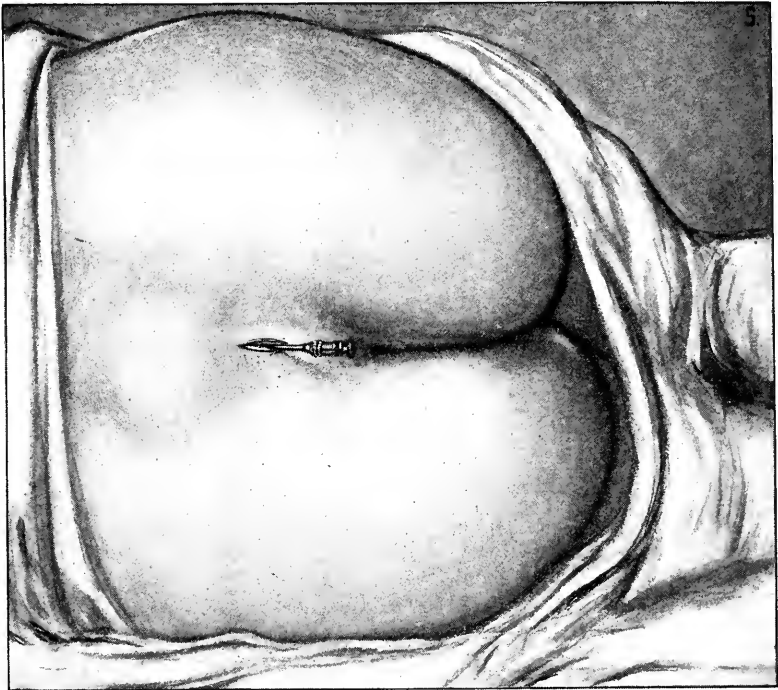
Introduction of needle. (Lynch.)

The following procedure is used in passing the needle: The needle is grasped in the right hand, and the index finger placed close to the point. It is then passed at an angle of 15 degrees until the bone is reached. The needle is then passed close to the bone until it has been entirely inserted for about one inch. At this juncture it is well to pause and make sure whether the needle is in the canal or not. This can be determined, as was

said above, by moving the needle back and forth, up and down, and from side to side. If it is in the canal, the wall will be found on all sides, and if it is not, the needle will readily pass through the skin.

If the needle is found to be in the canal, about 4 c.c. of the same solution is deposited on both sides. This is usually sufficient.

After this has been done the trocar is reinserted in order to prevent the escape of fluid, and the needle, with the trocar, allowed to remain in position until anesthesia is established. The reason for this is that if anesthesia is not established after fifteen minutes, it may be necessary to inject 1 or 2 c.c. more, and this is made much simpler if the needle has been left in place. It is important, first, for the fluid to be absolutely sterile, and of the same specific gravity as the blood in order that it may be readily absorbed.

After anesthesia has been established the needle is withdrawn, and some cotton and collodion placed over the wound. The patient is then placed in whatever position is desirable in order to perform the operation, and the rest of the procedure depends on what particular operation has been undertaken. If a prolonged anesthesia is necessary, urea and quinine may be substituted for cocaine. I have not as yet determined how much of the urea and quinine is necessary in order to produce complete anesthesia, or what would be the duration of the anesthesia under this process. I shall work this out later on.

We have now used this method of anesthesia in 20 different cases, and in all but 6 cases the anesthesia was perfect, and all that could be desired. In 1 case it was done very hurriedly, and the procedure abandoned and a general anesthetic given because of the nervousness of the patient. We did not inject a sufficiently large amount of the solution, so that this case should not be included.

Another case was very interesting. The patient was a young man, aged twenty-three years, with a carcinoma which involved the prostate and bladder. We were able to dissect the rectum and remove the bladder with absolutely no pain. However, when the dissection was almost completed and we were ready to separate the rectum from the peritoneum, the patient experienced some pain and much shock, as traction was made on the rectum. He also had severe pain when an attempt was made to cut the perito-

neum with scissors. Before proceeding further, we had to give the patient a general anesthetic in order to complete the operation.

From this case we learned a lesson; that operations involving the peritoneal reflexion are impossible with sacral anesthesia. If we had followed our usual method of blocking the hypogastric plexus above, we could have completed the operation without further pain.

The shock which occurred when we pulled on the peritoneal reflexion was due to traction on the lumbar and inferior mesenteric plexus of the sympathetic, and to the fact that we had not blocked this point.

In cases when operations were wholly confined to procedures involving the rectum they were accomplished with the greatest ease to the operator and comfort to the patient. In no instance did we use more than $\frac{1}{6}$ grain of cocaine, and that was used in the operation which involved the removal of the rectum and prostate. The point of interest in connection with this case is worth mentioning. Before dissecting the rectum free from the urethra and the removal of the prostate, one of my assistants tried to pass a sound into the bladder. Some difficulty was experienced on account of a posterior stricture; but after some gentle manipulation we succeeded in passing it and during all of this procedure, the patient had not the slightest sensation of discomfort or pain.

The value of this method, therefore, in cases of stricture of the urethra in hypersensitive individuals in whom it is necessary to explore the urethra or bladder, can easily be understood. Especially will it be found serviceable for old men on whom it is necessary to do a perineal prostatectomy, or in any procedure involving the urethra or bladder.

In 2 cases we entered the dura and drew off some fluid; it is well, therefore, to be on guard, as in some the dura is very low, and by changing the position of the patient during operation serious results may follow. In order to avoid trouble after the needle has been inserted the stilette should be withdrawn, and if a clear, watery fluid appears the operator will know that he has entered the dura, and due caution must be exercised. If it is then considered desirable to avoid spinal anesthesia, the stilette should be re-inserted and the needle slightly withdrawn.

CHAPTER IV.

## EMBRYOLOGY AND MALFORMATIONS OF THE RECTUM AND COLON.

LIFE has its inception when the spermatozoön enters the ovum. A seed will not germinate until water is added. So with the ovum, when a certain amount of chemical substance reaches it through the spermatozoön, it starts to germinate.

Loeb has been able to produce life artificially by adding certain chemicals to the ovum of the sea-urchin. Very few, however, out of the hundreds of eggs, arrived at maturity. This is explained as being due to the fact that we have not, as yet, ascertained the definite amount of chemicals that is necessary to strike an exact balance, such as is contained in the spermatozoa. The ovum is fertilized as a single cell. The fully formed embryo results from the multiplication of these cells (due to a division of the parent cell). By the end of the first month all parts of the body are recognizable.

From this it will be seen that any arrest of development, or any irregular development, can be explained by a knowledge of embryology. Without this knowledge a proper appreciation is impossible.

About the end of the third week an anterior projection or budding of the yolk sac can be appreciated. This goes later to form the fore-gut and with that portion of the future intestine anterior to a line drawn through the middle of the yolk sac, forms the entire small intestine, pharynx, esophagus, stomach, and duodenum. Embryos have been examined at such an early stage that there was no evidence of the fore-gut or hind-gut, but the allantois was present as a budding or projection from the yolk sac; showing that the allantois is formed at a very early stage, and before the hind-gut. It is believed by Mall, and others, that as the diverticulum or budding of the hind-gut

grows down, it carries with it the allantois until both reach that
bay at the caudal end of the embryo which is known as the
cloaca (Fig. 21).   The intestine now gradually develops, and
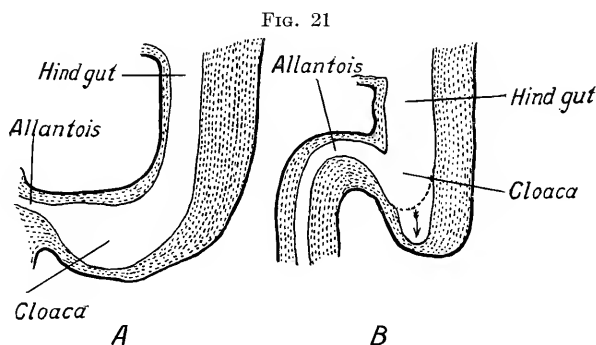
Formation of the cloaca.   (Keith.)

the changes that take place are of interest, because of the persis-
tence of embryonic features which may later require surgical
measures for their correction.   That portion of the intestine
which is described by some embryologists as the mid-gut is

FIG. 22
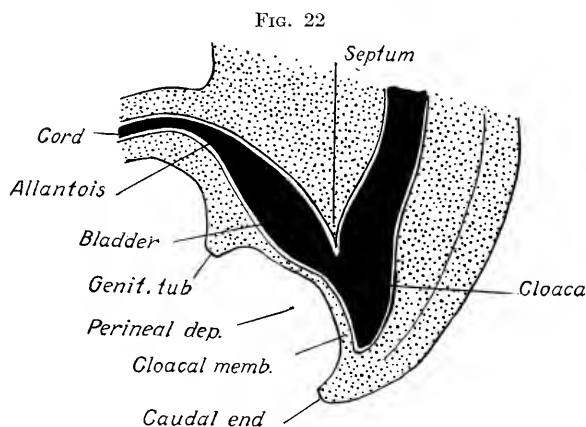
Formation of the cloaca; later stage.   (Keith.)

suspended from the roof of the yolk sac (Fig. 23).   The neck of
the yolk sac elongates and narrows.   The portion of the intestine
known as the U-shaped tube is really outside of the abdominal

cavity at this period. This is explained by Mall as being due to
the rapid growth of the liver, which forces the bowel outside of
the abdominal cavity. As the yolk sac becomes smaller, the
intestine retrogresses into the abdominal cavity, covered by the
somatopleura. The vitelline artery, which afterward becomes
the superior mesenteric, is the artery of the U-shaped tube (see
Fig. 23). Between the end of the first month and the beginning
of the second a diverticulum or outgrowth appears on the border

FIG. 23
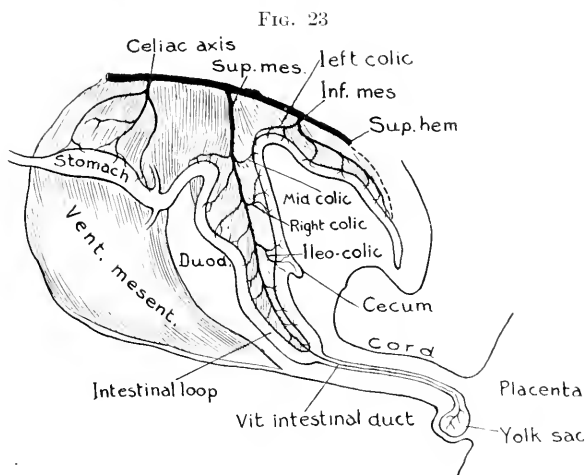
Primitive gut before rotation. (Keith.)

of the posterior limb of the U-shaped tube. This diverticulum
represents the future cecum and appendix. At this period the
cecum and the large intestine are about the same caliber as the
small intestine, and it is not until the fifth month that the cecum
becomes appreciably larger than the small intestine. The appendix
is the terminal portion of the cecum, which has retained its
embryonic character (Fig. 24). In other words, the future appen-
dix does not keep pace with the growth of the cecum, but retains
its embryonic size.

As the small intestine continues to grow a change takes place
in the posterior loop in the U-shaped tube. The portion of the
bowel aboral to Meckel's diverticulum rotates around to the
left, so that the cecum comes into a position in front of the right
kidney (Fig. 26).

A proper understanding of the various arrests or malformations that may occur in the caudal end of the hind-gut can only be obtained by a knowledge of the development of the hind-gut, genito-urinary organs, and anus.   With a mental picture of the various stages of growth, this is simple.   For this reason a brief outline, with diagrams to illustrate, is given.

Fig. 24   Fig. 25   Fig. 26
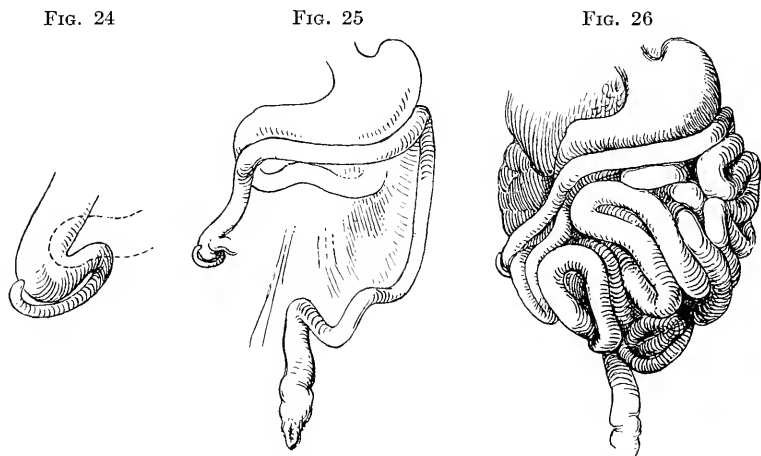
Figs. 24, 25, and 26.—Drawings made from dissection of a three-months-old fetus, showing position of the cecum after rotation.   (Lynch.)

The caudal end of the hind-gut, allantois, and Wolffian duct have a common opening in an embryo about twenty days old, and this opening is called the cloaca.   Such a condition exists in certain animals.   In the human subject, however, the common opening is gradually subdivided by septa, with different compartments, which compartments eventually become the bladder, urethra, and urogenital sinus (Fig. 27).

The first change that takes place is the separation of the rectum from the rest of the cloaca.   This is effected by the septum between the allantois and the cloacal opening of the intestine growing down from above into the lumen of the cloaca, until it reaches the cloacal membrane.   If the septum is incomplete a communication between the rectum and the genito-urinary organs occurs, or the rectum may open directly into the bladder, urethra, or vagina, as the case may be, depending on the stage

or period at which the arrest of development took place. Fig. 27 illustrates this point.
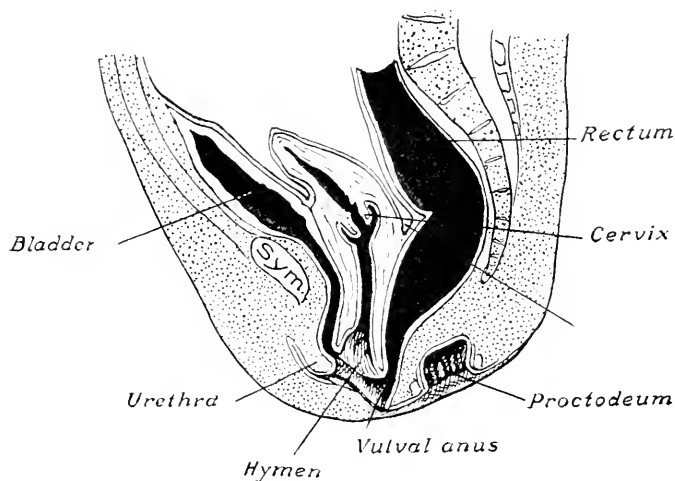

Fig. 27
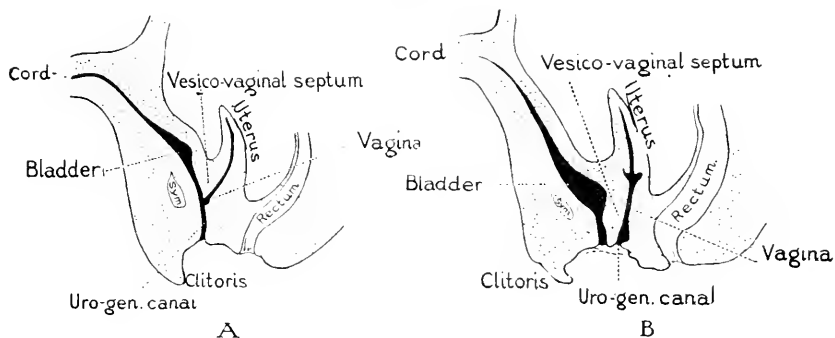
Descent of vulvovaginal septum. (Keith.)

Fig. 29 represents a condition where the rectum is arrested during its descent, before it reaches the cloacal membrane.


Fig. 28

Hind-gut opening into vulva. (Keith.)

The third division of the cloaca is affected by the gradual growing down or encroachment of the vesicovaginal septum into the anterior division of the cloaca.

5

After the urogenital septum reaches the cloacal membrane it fuses with it, and by this fusion the cloacal membrane is divided into two parts; the posterior is termed the anal membrane, and the anterior the urogenital membrane.

By the growth of the perineal body or septum, and its ultimate union with the urogenital septum, the final separation of the urogenital sinus from the rectum is complete. If union fails to take place the rectum communicates with the prostatic portion of the urethra; or, in the female, with the vulva (which is the counterpart of the prostatic urethra) (Figs. 28 and 29).

Fig. 29
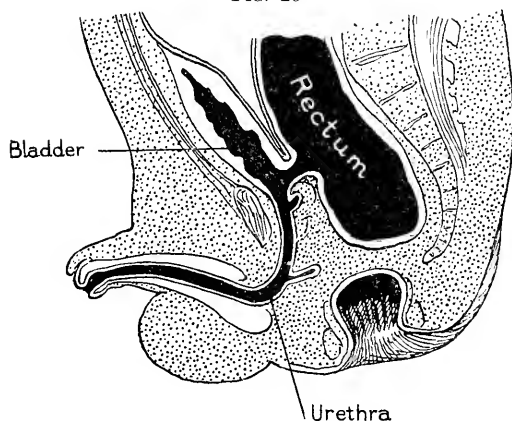
Hind-gut opening into the bladder.   (Keith.)

At the second month of fetal life there is a common muscle for the urogenital and rectal outlets; about the third month a division of this muscle takes place (Fig. 30, Keith). This naturally results from the development of the perineal body at the beginning of the third month, when the perineal body is formed; the sphincter of the cloaca becomes divided into urogenital and anal parts; the sphincter of the urogenital passage and anus fuse in the perineal body; a part of the urogenital sphincter obtains an attachment to the ischium, and forms the ischiocavernosus and erector penis; another strand, the transversus perinei, with the formation of the urethra in the male; and the sphincter of the urogenital passage is carried forward with the bulb and forms the bulbocavernosus.

In all vertebrates division between the large and small intestines is demarcated by the ileocecal sphincter, which is developed from the circular coat of the bowel.   Occasionally in man the
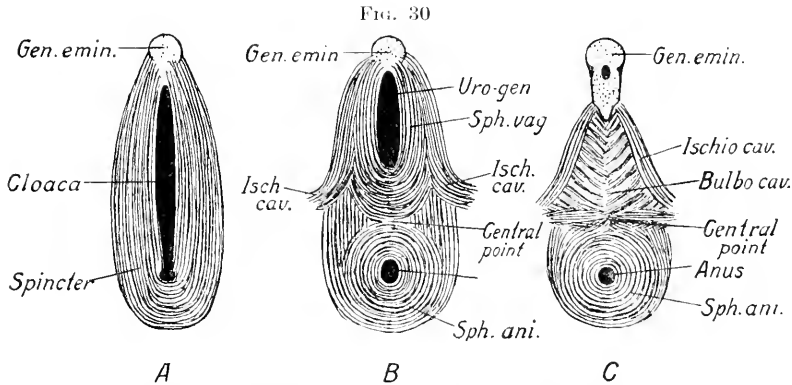
Fig. 30

Diagram showing development of perineal muscles.   (Keith.)

cecum is absent, the only evidence of division between the small and large intestines being the presence of an ileocecal valve. This is the normal condition in the frog and in several mammals, such as the raccoon.   In early life there are villi in both the small
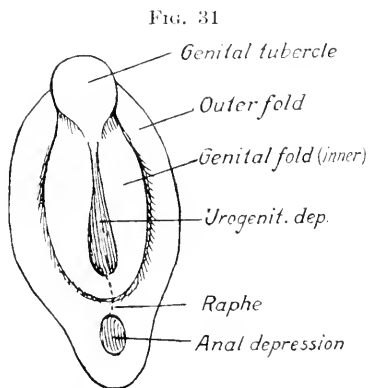
Fig. 31

Diagram of the external genital parts of the embryo.   (Keith.)

and large bowel; but by a process of flattening out or fusion the villi disappear from the large bowel, and their analogues are known as Lieberkühn's follicles.

A study of the comparative anatomy of this region shows that the cecum is largest in vegetable-feeding animals, and that there
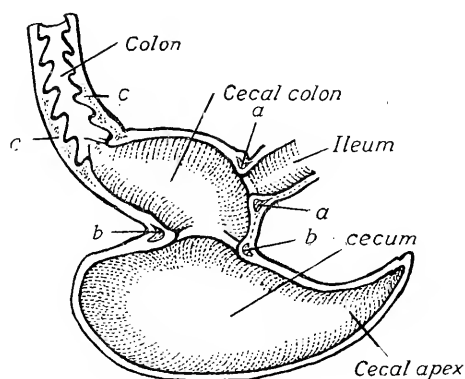
FIG. 32

Diagram of typical mammalian cecum. (Keith.)

is a corelationship between the development of the stomach and the cecum.   In the horse the cecum and cecal colon are com-
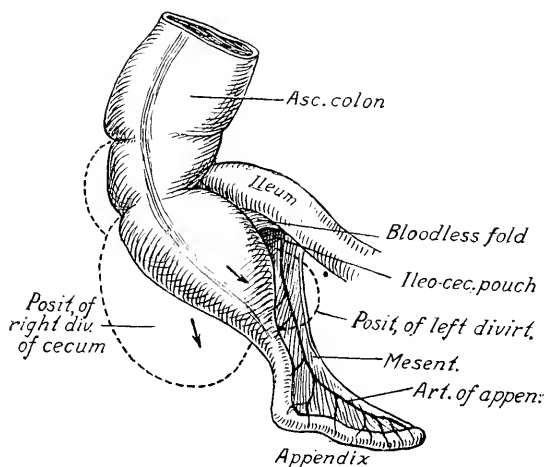
FIG. 33

Diagram of the cecum and appendix at birth. (Keith.)

plicated (Fig. 32), the stomach simple.   In animals that live on a flesh diet the cecum is small, as, for instance, man and the dog.

The only difference between the latter and man is that the cecum remains in the second position in the dog, whereas in man it descends into the iliac fossa, or the third position. It frequently happens in man that the cecum remains in the second position under the liver.

DEVELOPMENT OF THE CECUM AND COLON.

About the end of the first month a diverticulum appears on the free border of the posterior limb of the U-shaped loop. This elevation or diverticulum later goes to form the cecum and appendix. At first there is no appreciable difference in size between the small and large intestine; but about the first month of fetal life the cecum and colon begin to develop rapidly, the tip of the cecum retaining its fetal dimensions. It can be seen from this that the appendix is the undeveloped end of the cecum. About the seventh week of fetal life, owing to the great development of the anterior limb to form the duodenum, jejunum and ileum, the U-shaped loop is caused to rotate, so that the splenic flexure is forced into its place near the spleen, and the transverse mesocolon is brought into contact with the mesogastrium, which forms the great omentum. Those two layers adhere, and thus the transverse mesocolon is formed by the fusion of the mesenteries of the posterior limb of the U-shaped tube and the dorsal mesogastrium. The rotation places that portion of the mesentery which forms the ascending mesocolon against the duodenum, and at the same time the duodenum is pressed into its permanent position in front of the right kidney. The cecum thus comes to assume its second position, near the right kidney and gall-bladder, and remains in this position until birth, when, owing to the growth of the colon, it gradually works its way down to the third and permanent position in the right iliac fossa. This occurs only in animals that assume the upright position.

During the descent of the cecum the appendix may be caught, and, as frequently happens, we have what is known as a postcecal appendix, or extraperitoneal appendix.

At birth the small and large bowel have practically one mesentery; but after birth, what is known as a physiological peritonitis

takes place; the ascending colon and cecum sink, and adhesion occurs; thus the cecum and ascending colon are fixed in place.

It is during this period that irregularities in fixation are apt to occur, and will, we think, explain the formation of the cobweb adhesions.

PROCTODEUM.

A blind proctodeum may result in a well-formed anus ending in a cul-de-sac, known as an imperforate anus (Fig. 34). An event in the embryology of the rectum and anus determines a great pathologic occurrence in early life, namely, imperforate anus.
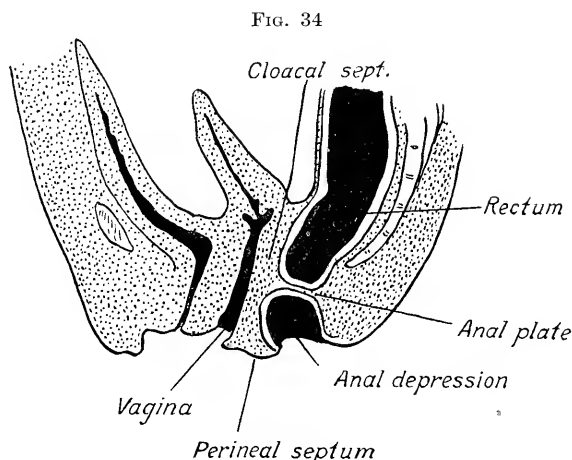
Fig. 34

Blind hind-gut resulting in a well-formed anus ending in a cul-de-sac.   (Keith.)

The termination of the hind-gut, which has a blind caudal extremity, forms the rectal part; whereas an inflection of the ectoblast forms the anus. Between them there is present a membrane known as the anal membrane. Should the anal membrane be invaded by connective tissue, it will remain imperforate. Sometimes it partially breaks down so that the constriction is not complete; under these circumstances there may be occlusions of varying degree. Sometimes this membrane is very thin, and it may be carried down by meconium, in which event it may possibly be mistaken for prolapse. The distance between the rudimentary anal canal and the caudal end of the hind-gut

may be considerable and the tissues between these two may be composed of fibromuscular structures, as in Fig. 35.

Fig. 35

Bladder
Uterus
Cervix
Rectum
Os.externum
Vagina
Anal depression
Perineal Body
Urethra
Clitoris
Hymen

Ending blindly. (Keith.)

Fig. 36

Cloacal sept. imperfort

Rectum
Anal plate
Anal depression
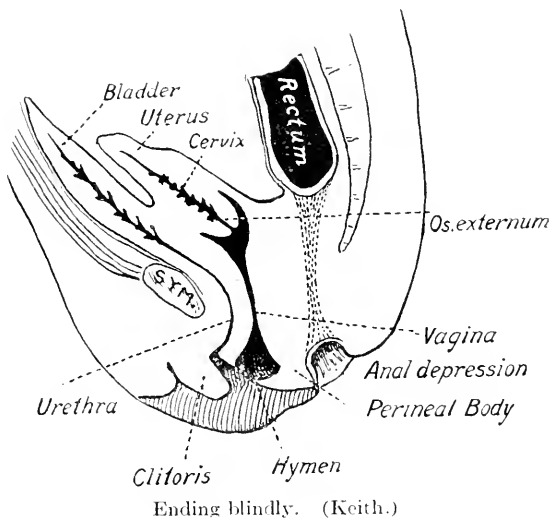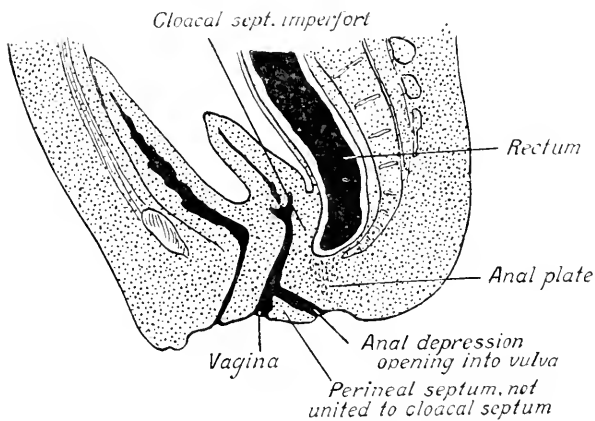opening into vulva
Vagina
Perineal septum, not
united to cloacal septum

Anal depression opening into the vulva, perineum, or scrotum. (Keith.)

The urethra may open into the proctodeum, as in Fig. 37. When this occurs it is due to an imperfect union between the perineal body and urorectal septum.

The proctodeum may open into the vulva, perineum, or scrotum. An imperforate anus may be well formed or poorly developed, with an opening into the vulva, perineum, or scrotum. This connection is probably due to imperfect union of the perineal body (Fig. 36).

Imperforate anus with vulvar outlet is exceedingly common, and corresponds to anterior urethral outlets in the male (Fig. 37). It is due to an imperfect union of the perineum, but differs from a true cloaca in that it more nearly resembles a fistula; whereas, in the true cloaca the outlet is well formed, and more nearly corre-

Fig. 37
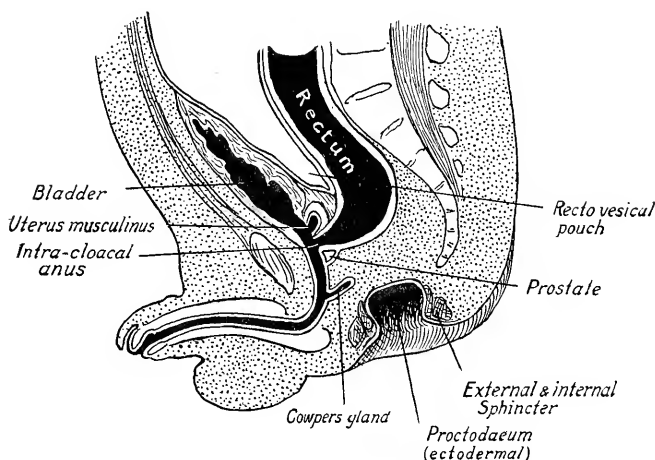
Hind-gut opening into posterior urethra.   (Keith.)

sponds to a true anus. Another difference is that in all probability, in the majority of vulvar outlets, the hind-gut opens below, rather than above, the levator ani; whereas in a true cloaca, it opens above the levator ani.

The anus may open at a point posterior to the normal opening, provided the muscles are well developed; this malformation is not of very great importance, and it is not one that requires surgical intervention.

Irregular development of the proctodeum. The proctodeum may be absent. This malformation is usually associated with others, and in most cases where the proctodeum is undeveloped

the hind-gut opens into some other organ. The proctodeum
may be undeveloped and the hind-gut may open some distance
from the anus.

The proctodeum may be apparently well developed, but on
close inspection it is found to be constricted at some point. In
such a case, if there is connection with the hind-gut, the mal-
formation is not usually discovered until late in life, and then it

Fig. 38

Partial membranous occlusion of the anus.   (Lynch.)

is probably looked upon as a stricture. As a general rule, however,
these cases come under the observation of a surgeon early, on
account of some irregularity of the bowel movement, or some
pathological lesion.

**Partial or complete membranous occlusion of the anus is not, by
any means, rare.** The skin may almost completely cover the
outlet, or it may run as a continuation of the raphe (Figs. 38 and
39). When only partial occlusion occurs, it is usually overlooked,

and may only be observed later on in life, when for some reason
or other the individual comes under the observation of a physician.

Fig. 39
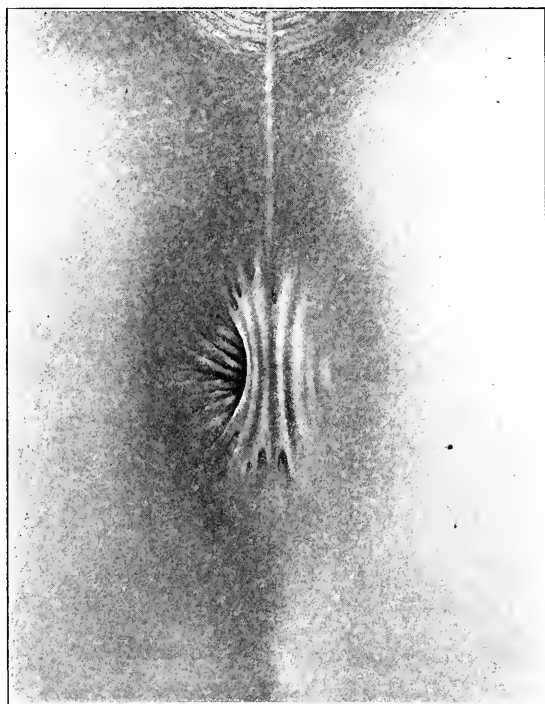
Membranous occlusion of the anus.   (Lynch.)

**The original common opening for the rectum, vagina, and urethra
may persist, constituting a cloaca.** This is the rarest of all malfor-
mations, but fortunately it is one that does not require immediate
attention.   For this reason, like many other malformations that
do not give immediate symptoms, it is only discovered when the
patient comes under the observation of a physician because of
some bowel irregularity, or when discovered by accident.

A very interesting case of this condition, the history and
subsequent treatment of which is described under "General
Treatment," came. under the observation of the author some
time ago.

The bladder may maintain its connection with gut (from which it was originally derived as a portion of the allantois) and the fecal matter pass through the urachus and empty at the umbilicus and urethra (as in Fig. 40). The diagnosis in this condition would be made by the fact that some of the fecal matter passed through the umbilicus and some through the urethra, it being assumed that in this case the anus was malformed.

This is an extremely uncommon deformity; but one case recently came under the observation of Prof. Stockard.

Fig. 40
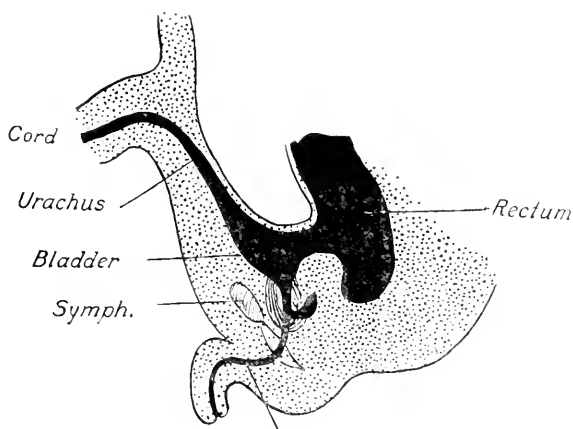
Patent urachus. Hind-gut opening into bladder. (Keith.)

The bladder may maintain its connection with the gut (the urachus not persisting) and the fecal matter pass through the bladder and empty through the urethra (as in Fig. 29). It will be remembered that in the first part of this chapter we spoke of the bladder being derived partly from the cloaca and partly from the allantois. When, for some reason or other, there is no arrested development of the saddle or septum which separates the rectum from the bladder, an opening remains between the bladder and the rectum, with the result shown in Fig. 40. In such a case, if the anus were malformed, or did not exist, the fecal matter would pass through the urethra, and the diagnosis could be made from the presence of the fecal matter in the urine.

The hind-gut may open into the vagina (as in Fig. 41), the posterior urethra, or the uterus. These deformities are not uncommon, with the exception of the uterine connection, and, as the uterus is developed separately and has no connection with

Fig. 41
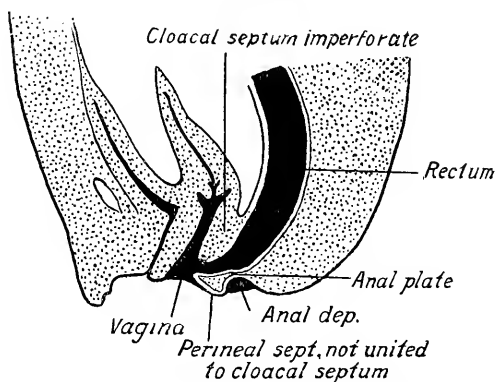
Hind-gut opening into vagina.   (Keith.)

Fig. 42
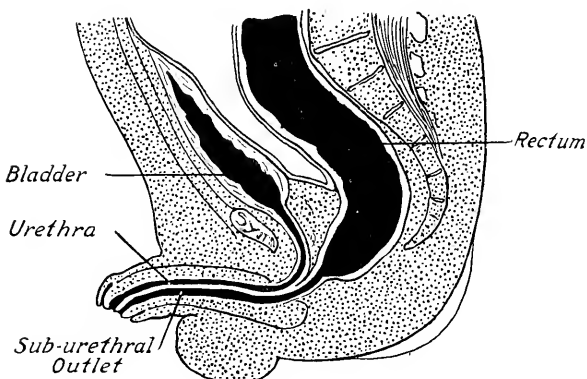
Imperforate anal canal with suburethral outlet.   (Keith.)

the rectum, we are inclined to believe that the cases reported of an opening into the uterus were fistulæ rather than malformations. However, the opening in the vagina or posterior urethra is easily explained as being due to failure of the perineal body to unite with the cloacal septum.

Absence of the Rectum and Entire Large Intestine, with an Opening at the Umbilicus.—The hind-gut may be arrested in its development at any point between the vitelline duct and the rectum. Such a case is reported by Sir Charles Ball. The large intestine may be double, due to a splitting or budding of the growing hind-gut. A case of this kind recently came under the observation of Dr. Schultz. We may have a double intestine with one mesentery, or the bowel may be separated by the septum. The hind-gut may find an exit in a suburethral opening. Fig. 42 illustrates this malformation.

TREATMENT.

The early recognition of intestinal and rectal malformations is exceedingly important; but particularly so where the bowel has no outlet, because it is in this case that early surgical intervention is imperative if the life of the child is to be saved.

If the bowel finds an outlet through the neighboring viscera, or by a fistula to the skin, it may be possible (depending largely on where the opening is) to avoid operation until the child is a little older, as the mortality even under the most favorable circumstances is exceedingly high. However, where there is no outlet to the bowel, there can be no question as to what should be done; surgery is absolutely indicated, but the surgeon should do as little as possible, or as little as is consistent with relief of the obstruction.

There is no authentic record of any instance in which an operation was performed for the relief of imperforate anus before the seventeenth century. After that time the trocar was used, with the hope of finding the bowel and relieving the obstruction. Indeed it was not until the eighteenth century that any definite attempt was made to relieve these cases by surgical measures. Up to 1835 very few surgeons had given any attention to such cases.

At this time Amussat, in a paper, treated malformations from a scientific standpoint; and all operations since that time have been based upon the suggestions of Amussat.

Before discussing the treatment of individual cases, it may

be well to adopt a few broad principles which can be made to apply to all cases. They are as follows:

1. An artificial anus is indicated when the hind-gut ends blindly, and there is some doubt as to the distance between the hind-gut and the proctodeum.

2. When the hind-gut has found an exit, either by fistula or through some other organ, and the distance between the anus and the opening of the hind-gut is considerable, it is safer to wait until the child is a little older before adopting surgical measures, provided the contamination with fecal matter does not threaten his life. A fistula can always be enlarged and made to take the place of the anus until the child is older.

3. Vulval, vaginal, and cloacal openings do not call for surgical interference, as they usually are sufficiently large to permit of free drainage of the bowel and can easily be corrected at a later period.

4. When the bowel opens into the bladder or posterior urethra, and the opening is not sufficiently large to drain the bowel, and contamination or ascending infection threatens the life of the patient, an artificial anus will always settle the question until the child is older.

5. An operation for artificial anus, either under local anesthesia or a small quantity of ethyl chloride, is not attended by any considerable mortality.

6. In all cases in which there is doubt, particularly if the medical attendant is not an expert surgeon, and where there is obstruction, an artificial anus should be formed immediately.

7. A median incision is the best and safest, as it permits free access to all parts of the pelvis and abdomen, can easily be extended up or down, and is not likely to result in hernia.

8. After the abdomen has been opened, the most accessible part of the colon should be brought out, a glass rod passed through the mesentery, and the abdomen closed as rapidly as possible.

The axiom given by Murphy in suppurative appendicitis is particularly applicable here: "Get in quick and get out quicker."

9. All handling or mauling of the intestines in extremely young babies, and, indeed, in any abdominal operations, results in shock and should be avoided.

10. An operation for artificial anus should not extend over ten minutes.

History and Subsequent Treatment of a Case of Cloaca, with Congenital Megacolon.—The following cases came under the writer's observation:

Examination.—Heart and lungs normal, and, except for the absence of the anus and the presence of a common opening for the rectum, vagina, urethra with megacolon, the child was in perfect physical condition and otherwise well developed. The interesting and unusual feature of this case was the non-development of the anus, with over-development of the colon. A U-shaped tumor could be felt in the abdomen.

Fig. 43
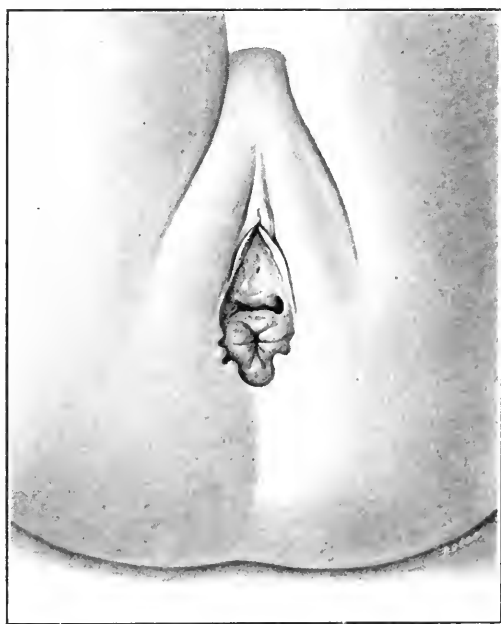
Cloaca.   Drawing made before operation.   (Lynch.)

Diagnosis.—Cloaca, with congenital megacolon. Fig. 43 is a drawing made before operation, and is a very accurate representation of the condition as it existed at that time.

Fig. 44 is a photograph taken at the same time.

Fig. 45 is a sagittal section which gives an accurate representation of the condition as it existed.

The patient entered the Polyclinic Hospital February 5, 1913. She was given castor oil, free movements resulting. Notwithstanding this, the rectum and colon were found to be packed with fecal matter and two irrigations per day were ordered of a 2 per

Fig. 44
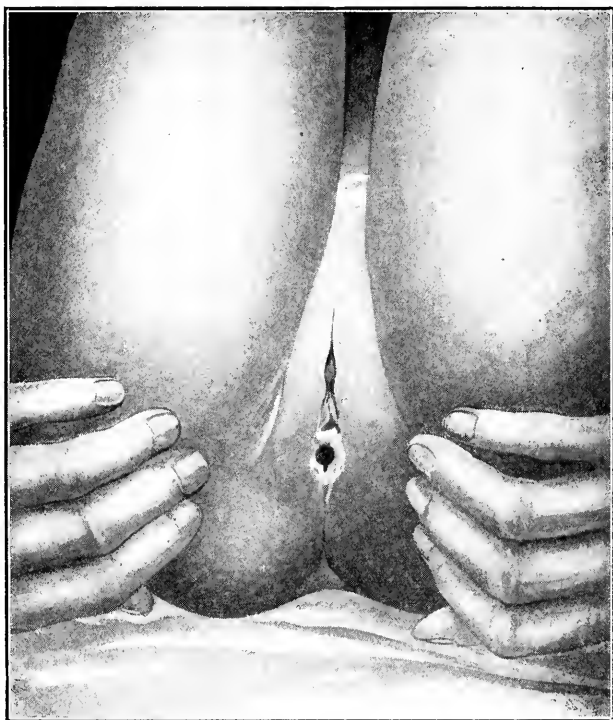
Cloaca.   (Lynch.)

cent. solution of hydrogen peroxide. On February 11 she was brought to the operating room, but some difficulty was experienced in getting her under the anesthetic, and, owing to the amount of fecal matter which was found in the colon after several washings, it was decided not to risk operating at that time, but to return her to the ward for further treatment until such time as the bowel should be thoroughly emptied. On February 12, Dr. Lyon

succeeded in getting the bowel cleaned and she was placed on the operating table on the morning of February 13, and put under the anesthetic without any difficulty by Dr. T. L. Bennett.

Fig. 45
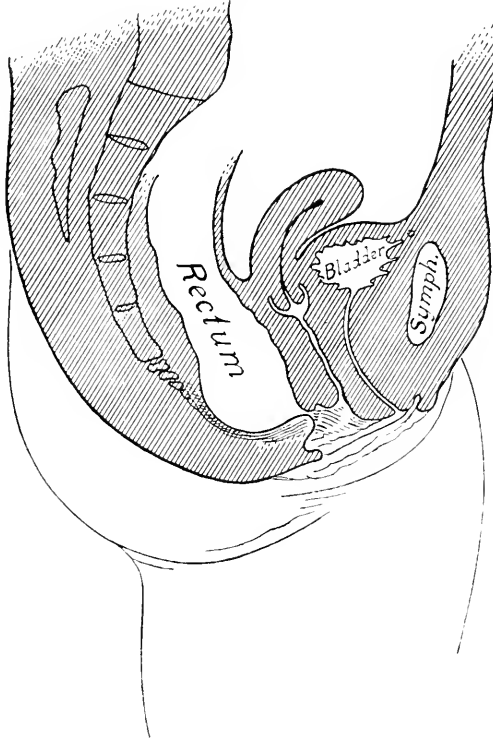
Sagittal section (cloaca case).   (Lynch.)

Operation.—An incision was made all around the bowel, as in Fig. 46.   Posteriorly this incision was carried back to within an inch of the coccyx.   The bowel was dissected free from the vaginal wall in front and all around from the surrounding tissue. The posterior incision was extended into and as far as the levator ani muscle.   The rectum was then dissected free from the labia and vagina, as in Fig. 47.   The levator muscle was now slit and the bowel allowed to drop down between the slit portions of the levator muscle, as in Fig. 48.   The muscle was then closed above

6

and below the rectum with interrupted catgut sutures, as in Fig. 49. The rectovaginal septum was brought down and the mucous membrane of the vagina sutured to the skin. The rectum was

Fig. 46
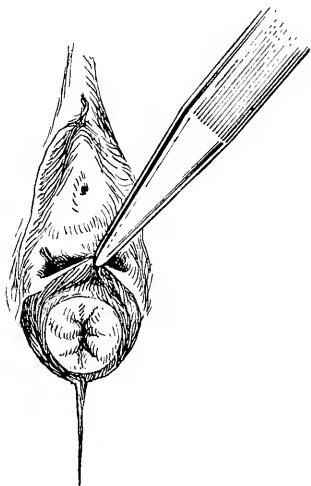
Cloaca operation, showing line of incision. (Lynch.)

Fig. 47
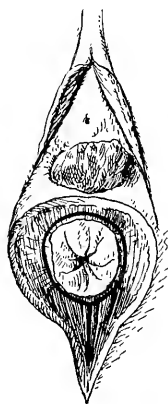
Cloaca operation, second stage. (Lynch.)

Fig. 48
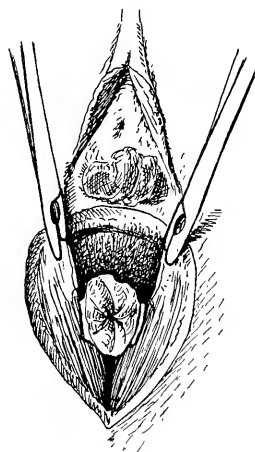
Cloaca operation, third stage. (Lynch.)

Fig. 49

Cloaca operation, fourth stage. (Lynch.)

attached to the levator ani muscle by two or three interrupted
sutures (as indicated by *A*, Fig. 49); after which the mucous
membrane was sutured to the skin,
and the skin above and below the
anus closed by interrupted catgut
sutures.

**The simplest and most frequent of
malformations** is a condition where
the fibrous tissue has invaded the
anal rectal plug; a membrane only
separates the anus from the rectum.
Such a condition is usually remedied
by removal of the membrane, either
partially or *in toto*. However, where
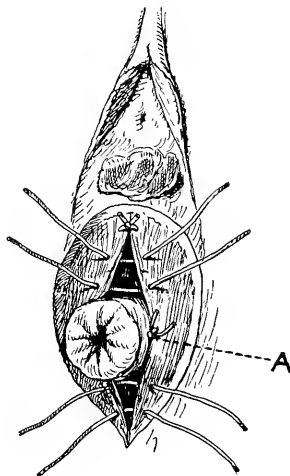such a membrane does not exist, and,
though the anus may be well formed,
there is evidence of a bulging hind-
gut, a definite procedure is adopted.
One cannot say with any degree of
certainty where the hind-gut is ar-
rested. It may be at the brim of

FIG. 50

Cloaca operation, fifth stage.
Operation completed. (Lynch.)

the pelvis; or it may be arrested high in the abdomen. Under
these circumstances the first thing to do is to ascertain as far
as possible the location of the rectum.

*So far as we know, there is no instance where the x-ray has been
used to determine the location of the bowel.*

But it would seem as though it might be of some assistance,
because if there is only a little meconium or gas, a fairly good
outline of the location of the bowel might be obtained. This is
merely given as a suggestion, the writer not having had an
opportunity to put this idea to test.

Under sacral or local anesthesia an incision can easily be made
from the posterior commissure, if any anus exists to the side of
the coccyx, and through this incision the fingers could be inserted
and an effort made to locate the hind-gut. If this is not successful
it would seem advisable, under local anesthesia, to make an
opening in the abdomen outside and to the left of the rectus
muscle, and the sigmoid or some other part of the colon brought

out with comparative ease, and with little or no discomfort to the child.   After an artificial anus has been established it would be fairly easy to determine the exact location of the rectum by means of the x-ray, after an injection of bismuth or argyrol.   By following this procedure it would seem as though the mortality should be very much less than if a general anesthetic were given.

Fig. 51
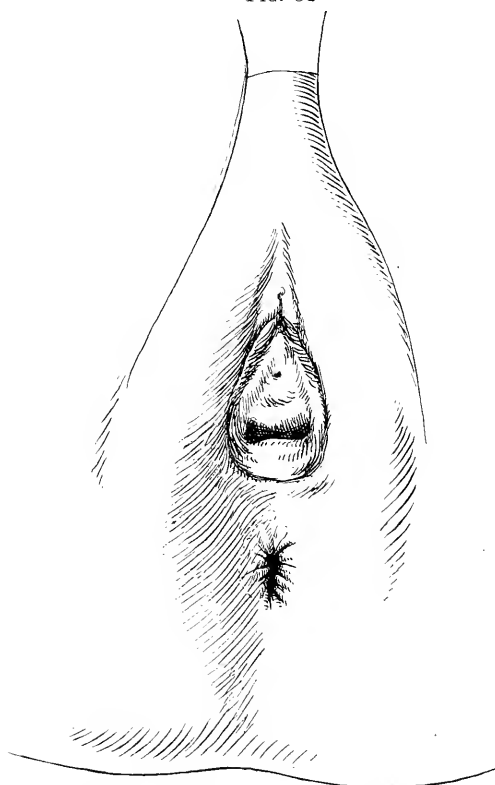
Drawing made after operation in cloacal case.   (Lynch.)

THE CASE OF M. (aged nineteen years).—This case illustrates the complications that may result from non-fusion of the colon.

Family History.—Mother died at the age of twenty-six years, of an infection, following a premature labor.

Habits.—Takes two cups of coffee, no tea.   Smokes and drinks in moderation.

Past History.—Had all the diseases of childhood.

Present Illness.—He complained of cramps at breakfast time, but went to business, nevertheless. During the day the pains grew worse, and he had to lie down. Returned home at four o'clock, as he was unable to work any longer on account of the continued pain. The pain was not so severe as to cause him to go to bed. Had supper at 7 P.M.—three chops, a potato, and a baked apple. He went for a walk after this, made some purchases, and tried to

Fig. 52

Photograph taken after operation on cloacal case. (Lynch.)

forget his pain. He retired at 11 P.M., and thought that with the aid of a hot-water bottle he would get along all right. He was not in bed long when the cramps became so severe that a doctor was sent for. The patient was very pale, and cold perspiration showed evidence of a shock. The pains were in the left iliac fossa. He vomited three times, and the doctor gave him a hypodermic of morphine. This did not relieve the pain. At the same time he received a dose of castor oil (which was promptly vomited) and later he took a dose of salts, which also returned. Later on the doctor gave him another dose, which was not retained. Hot

applications were placed over his abdomen, and several doses of morphine were administered hypodermically, but nothing relieved the patient.   This state of affairs continued all night long until about six in the morning, when the pain diminished and he felt more comfortable.   His bowels had not moved, nor had he passed any gas.
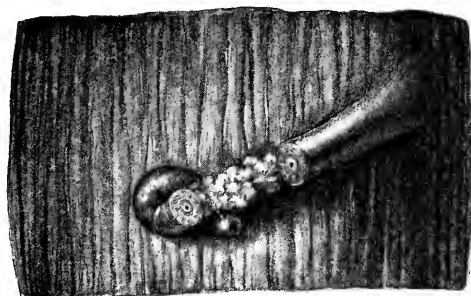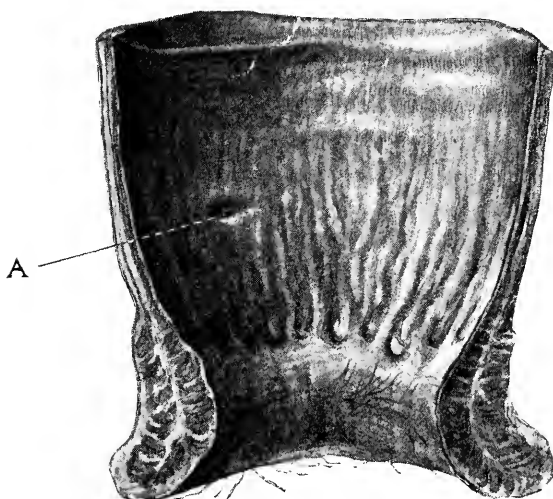
Fig. 53

Fig. 54

Figs. 53 and 54.—Diverticulum of rectum.   (Ball.)

He felt fairly comfortable in the morning, had occasional colicky pains, but they were not severe enough to necessitate morphine.

I saw the patient at seven o'clock that evening, in consultation with Dr. Brozier, of Hoboken. He was then fairly comfortable. The abdomen was not very tense, there was more rigidity of the right than of the left rectus muscle. The pain and tenderness seemed to be confined to the left iliac region. Nothing could be made out by palpation or percussion. The pulse was 72, the temperature normal, the respirations 24.

Examination through the rectum revealed nothing except ballooning. He was given an enema of normal saline solution, in the knee-chest posture, and the result was good; the patient passed a considerable amount of gas, and quite a little fecal matter.

The parents were advised to remove the patient to Miss Alston's Hospital in New York, so that he might be under our observation. He arrived there about ten o'clock, in good condition. His pulse, temperature, and respirations were normal. He was given an alum enema, and passed some gas and fecal matter.

The proctoscope was inserted, but revealed nothing except a ballooning and congestion of the rectum. He was suffering very little pain. At twelve o'clock his temperature went up to 101°, his pulse to 107, and his respirations to 30. The pain was now located in the right side of the abdomen, principally over McBurney's point, and a distinct mass could be palpated in this same region. We decided to operate.

A Battle incision was made. On reaching the peritoneum it was found to be intensely congested, and on opening it, a muddy fluid exuded in large quantities. The portion of the bowel underneath the incision was enormously ballooned, congested, cyanotic, and covered with plastic lymph.

On inserting the finger, neither the cecum, appendix, colon, nor ileum could be located. The finger was now swept around to where the ileum would normally be, and followed the distended bowel up, until the under-surface of the liver was reached. It was found that the cecum and appendix were adherent to the under-surface of the liver by means of a plastic exudate. It was brought down to position, and, in bringing it out, the inner leaf of the mesentery was lacerated.

The wound was now packed off very carefully with warm pads,

and the cecum, ileum, and colon pulled away outside of the abdomen. The ileum and colon had one mesentery, which was very long, and allowed of the whole of that part of the intestine being lifted away outside of the abdominal cavity. Everything was packed off very carefully, and an incision made in the cecum. Large quantities of fecal matter were taken away. The colon was then washed out with warm solution until all the fecal matter was thoroughly removed. The gut was covered with pads wrung out of a hot saline solution. This was kept up for about fifteen minutes, until the color of the bowel was fairly normal. The opening in the bowel was then closed by means of a clamp. All the soiled pads were then removed, and everything washed off with saline. Then the mesentery was repaired, clean towels were applied, and the colon, cecum, and a portion of the ileum were brought outside the abdominal cavity. A long cigarette drain was placed on the outer side of the colon, where the mesentery was ruptured, and brought outside of the abdominal cavity. The wound was now closed very rapidly by means of through-and-through silkworm-gut sutures.

A large drainage tube was inserted through the opening in the cecum, and held in place by means of a few sutures. The peritoneum was closed around the cecum about 1 inch from the the opening, and the wound dressed in the usual way. The patient was returned to bed. Pulse, 108; temperature, 101°; respirations, 30. He was put in the Fowler position, and a Murphy drip started through the drainage tube in the cecum. He spent a very comfortable night. The wound healed by first intention. The patient was sitting up on the seventh day after operation.

The patient was given $\frac{1}{4}$ grain of morphine, and $\frac{1}{150}$ grain of hyoscine three hours previous to operation.[1] He was brought into the operating room at 8.10. Gas and ether anesthesia. The cecostomy opening was temporarily closed by means of collodion and cotton. The abdomen was washed off with alcohol, and afterward painted with tincture of iodine. An incision was made about 3 inches long on the outside of the left rectus muscle.

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[1] The first operation was to relieve the obstruction in the cecum; the second (short circuit), on account of the double obstruction in the colon; and the third (ceco-sigmoidostomy), to drain the blind end of the obstructed colon.

The entire colon was examined, which could be easily done, owing to the fact that it had a very long mesentery; but everything was so tied up by adhesions that great difficulty would have been encountered in breaking up these adhesions, and subsequent adhesions to the small intestine might have occurred. The descending colon, sigmoid, and transverse colon were all adherent to one another. It was therefore decided to establish communication between the ileum and the upper portion of the sigmoid. We accordingly performed an ileosigmoidostomy. The wound was closed in the usual manner. The patient was allowed to sit up the second day after operation. No gas or fecal matter passed through the rectum, everything coming through the cecostomy opening. Some fear was therefore entertained lest, owing to kinking, or some other mechanical obstacle, the opening between the ileum and sigmoid was closed.

The finger was passed through the cecostomy wound, and after searching for some time the opening into the ileum was discovered. With my finger in the ileum, as a guide, I passed a rectal tube through the ileocecal valve into the ileum. Some saline solution was now allowed to flow through the tube. It passed out through the rectum with some fecal matter and gas, thus settling the question of the patency of the opening.

Under cocaine anesthesia the opening of the cecum was closed. Twenty-four hours after operation the patient developed symptoms of intestinal obstruction, and it was, therefore, deemed advisable to reopen the opening of the cecum. This was done, and a large quantity of fecal matter washed out with saline solution. It was then decided to adopt some measures to drain the large intestine. A median incision and careful examination revealed the fact that it would be impossible to make an anastomosis between any two legs of the large intestine, as the transverse colon was so intimately mixed up with the small intestine, and so adherent, that any effort to remove it would leave a raw surface which might result later in an obstruction. It was finally decided to anastomose the cecum to the sigmoid, and we accordingly did a cecosigmoidostomy below the iliac opening. The patient made an uninterrupted recovery and was out of bed in four or five days.

CHAPTER V.

HEMORRHOIDS.

HEMORRHOIDS are divided into two classes, external and internal. The external may be varicose, thrombotic, or connective tissue piles.

EXTERNAL HEMORRHOIDS.

Varicose External Hemorrhoids.—Varicose external hemorrhoids are due to engorgement of the veins surrounding the anus and are generally associated with some inflammatory trouble and relaxation of the skin. We frequently see them in spasmodic conditions of the sphincter and in fissure, and they are probably produced by straining at stool. In our experience this condition is seldom troublesome and is only brought to the attention of the patient when associated with some more serious condition, such as fissure or a proctitis. Occasionally the veins become so dilated that following violent exercises or straining they rupture, and a little ulceration of the skin results.

Treatment.—In spasmodic conditions of the sphincter gradual dilatation should be employed with the use of an astringent ointment, such as suprarenal extract 2 drams to the ounce of vaselin. Cold applications are very beneficial, especially if there is sweating of the parts; belladonna ointment, about 25 per cent., is also useful. Hot applications in the form of fomentations, continued for five to ten minutes, give great relief. Two cloths should be used, one remaining in the hot water, while the other is wrung out and applied.

Of course, this condition should not be mistaken for the true varix or angioma which is of a uniform dark blue color, and is occasionally seen in this region. Differentiation is readily made when it is remembered that the latter is congenital and causes a sense of fulness around the anus which is increased by straining; and that the varicose external hemorrhoids never attain the size that the varix does.

Thrombotic External Hemorrhoids.—These are of different color and shape according to the extent of the hemorrhage and the location of the thromboses, which may be either single or multiple. If the blood is extravasated beneath the skin, the piles are of a cyanotic blue color, but if it lies deep there is little change in the appearance of the skin. Sometimes the piles are round, sometimes oblong, and sometimes pear-shaped. They are generally situated at the margin of the anus and are due to a thrombosis within the vein, or to a rupture of the vein and escape of the blood into the surrounding tissues until the elasticity of the skin or surrounding tissues is so overtaxed that it refuses to stretch any more and sufficient pressure is thus exerted to control the hemorrhage.

Discussion has been rife as to whether the clot is formed within the vein, or the vein ruptures and the blood is extravasated into the surrounding tissues. It seems probable that both conditions exist, and it is hardly possible that clots as large as a cherry should be contained in any vein that surrounds the anus, though we have seen clots of fair size so enclosed. Ball says that he has had these tumors examined and that in every case he found the thrombosis within the vein. It may have been partially surrounded by the vein wall; but there is no vein in this vicinity capable of indefinite stretching.

Symptoms.—Following strain or exertion of any kind, pain is felt in the region of the anus, and later a sensation of burning and spasm of the sphincter.

If these tumors are not removed they are likely to terminate in some unpleasant way. Abscess may occur by infection through the circulation, through the skin, or through skin ulceration and exposure of the clot, thus forming an excellent medium for the cultivation and growth of bacteria. Enormous abscesses may result from this type of hemorrhoids. The clots may be gradually absorbed and entirely disappear; or they may organize and result in a calcareous mass and cause a great deal of inconvenience, but thrombotic hemorrhoids rarely reach this stage, unless the patient is very careless.

Fig. 55 shows a case where necrosis of the skin over the clot has taken place. If this had not been removed it would certainly have resulted in an abscess.

Treatment.—The best treatment, in our experience, is the immediate removal of the clot under local anesthesia. If the tumor is very large it is better to remove it *in toto*, as otherwise

FIG. 55
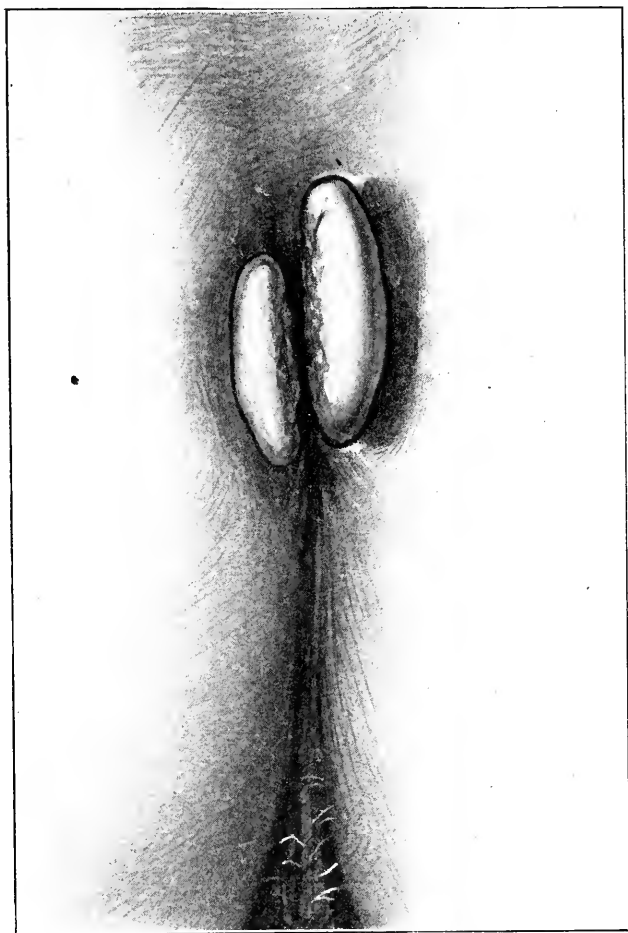
Inflamed and edematous external hemorrhoids. (Lynch.)

the overstretched and redundant skin becomes at once painfully edematous, and terminates in tabs which cause considerable annoyance. The technique of the operation is as follows:

A solution of cocaine, 1 to 500, is sufficient to produce local anesthesia.

First Operation: Removal of the Clot.—Before injecting the cocaine, a drop of carbolic acid is applied to the skin at the base

FIG. 56
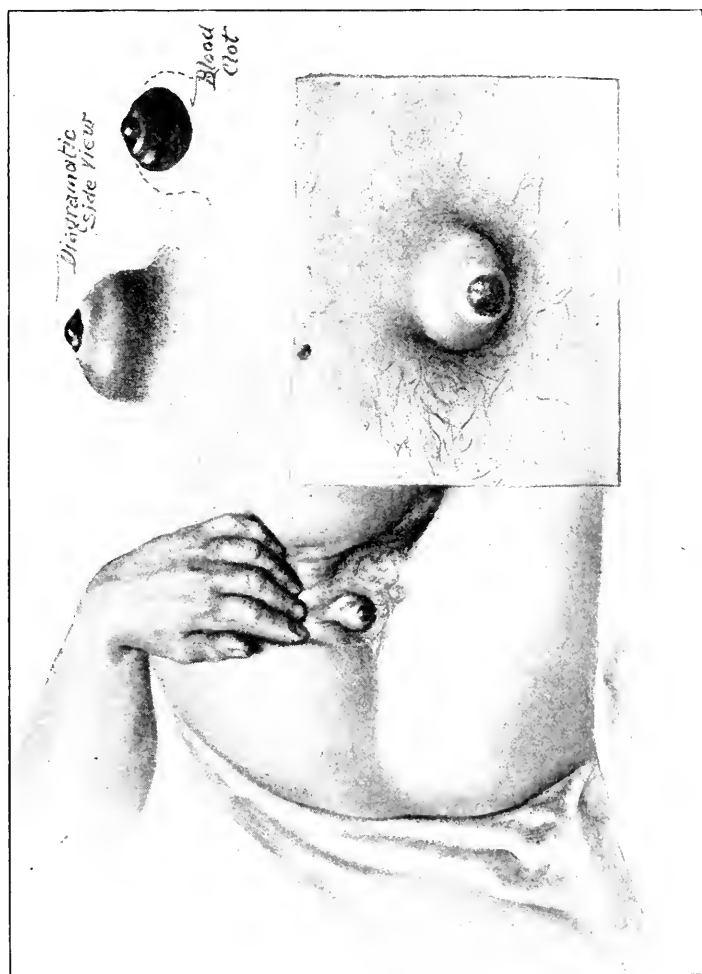
Thrombotic hemorrhoid. (Reproduction from a photograph.) (Lynch.)

of the tumor to anesthetize and sterilize the point of introduction of the hypodermic needle. A little cocaine is injected, and this is continued in a line which bisects the tumor, until the base on the other side is reached. A radial incision is now made through

the tumor and the main clot turned out; a careful search is made
for any minor clots, and these are removed with the scissors.
Gauze is then packed in, just sufficient to stop the oozing and
prevent accumulation of blood.   This is allowed to remain in
place twenty-four hours, when it is removed and ichthyol oint-
ment is applied.

Second Operation: Removal of the Entire Tumor.—In this case
the anesthesia is the same as in the former operation, except
that the cocaine is injected all around the base of the hemorrhoid,
which is then seized with a pair of artery forceps and removed
entire, by elliptical incision.   The skin can be brought together
with a suture, No. 1 plain catgut, or allowed to heal by granu-
lation.

Skin Tabs.—Finally we have to deal with the connective-
tissue, external piles, known as skin tabs.   It can be seen from
what has already been said that these may result from the last
named, after the clot has been absorbed, or even after the clot
has been removed, if sufficient skin is left.   There is a tendency
for such tumors to form under all circumstances, on account of
the puckering of the skin around the anus.   Therefore, any
condition that causes inflammation of the skin, such as pruritus,
varicosity, thrombotic hemorrhoids, syphilis, gonorrhea, etc.,
usually ends in the connective-tissue tabs.   Or, in other words,
the two surfaces of the skin are subcutaneously in apposition,
and when inflammation subsides agglutination results.

This form of hemorrhoids may cause the patient a great deal
of distress, the impossibility of keeping the parts clean constantly
subjecting him to local irritation and skin erosion.   If the inflam-
mation has been severe an abscess may result.   Such external
hemorrhoids may be perforated by little fistulous openings.   We
believe that this is due to infection following a thrombotic pile
or superficial abscess, or that it originates in a crypt, with sub-
sequent abscess formation.

Local Treatment.—In the early stages, appropriate treatment
gives relief and very often prevents the later formation of skin
tabs.   The applications of gauze, wrung out of very hot water,
and constantly applied for five or ten minutes at a time, will,
in a great many cases, give relief.   An ice bag applied to the
buttocks may have the same effect.   Gauze saturated with

boroglycerid and placed over the anus, and over this a hot-water bag, gives a most gratifying result. An ointment of suprarenal extract, 4 drams to the ounce, can be recommended; and stramonium, belladonna, and tannic acid in the form of an ointment are likewise helpful.

Surgical Treatment.—When well developed, and a source of worry to the patient, it is best to remove the tabs under local anesthesia. A solution of cocaine, 1 to 500, is injected, not into the tumor but all around its base. The growths are then removed,

Fig. 57

External and internal hemorrhoids. (Lynch.)

painlessly, by means of the knife or scissors. The skin can be brought together with a No. 1 plain catgut suture, but we prefer to allow it to heal by granulation, believing that, as the skin has thickened and harbors numberless bacteria, better drainage is thereby afforded.

INTERNAL HEMORRHOIDS.

Internal hemorrhoids are vascular tumors resulting from thrombosis, varicosity, dilatation of the blood pools, accompanied

by tissue infiltration, and redundancy of the mucous membrane in the anal canal.

Etiology.—Naturally we look to the anatomic structure for an explanation of the frequency of internal piles, and we find that we have veins of considerable size, without valves, extending from the anus to the liver, supported by cellular tissue, passing through the rectal wall, constantly subjected to pressure and running in a direction opposite to the fecal current. During exercise the abdominal muscles and diaphragm are brought into play; as a result the intestines are subjected to pressure and consequently interfere to a certain extent with the portal circulation. Again, the erect position of man militates against the current flowing in the upward direction. Some will object to libeling nature in this way and say that it is strange that such a mistake in construction should have been made. To be sure, nature never made these parts for the purpose of producing hemorrhoids; she made them as she did other parts of the body, normal, under certain conditions, but more or less susceptible to disease under other conditions. She did not provide against high living and the abuses that tax the capacity of that complex organ, the liver, and produce portal stasis. (A chain is as strong as its weakest link, and if the chain must give way it is better that the break should occur where it is accessible and easily repaired.) We might write at great length on this subject and yet not give all the conditions that predispose to hemorrhoids.

It is self-evident, from what we have pointed out, *that any interference with the circulation will, if continued for a time, produce hemorrhoids.* It is quite possible too, that some families exhibit a predisposition to this condition.

Certain subdivisions of internal hemorrhoids may be mentioned in passing. The strawberry pile, described by some authors as nevoid pile, in reality differs very little from an ordinary internal hemorrhoid, except that it is single, situated anteriorly or posteriorly, and bleeds a great deal (see Fig. 58, which gives a good idea of this type of hemorrhoid). A histological study of this class of tumor is here appended. Ball speaks of another variety, which he terms columnar piles. He probably refers to hemorrhoids which have existed for a long time, and as

a result of chronic inflammation and thrombosis are formed principally of connective tissue. These can readily be distinguished from other types by the fact that the mucous membrane covering them is of a bright red color, giving the appearance of a prolapse of the mucous membrane rather than of hemorrhoids.

FIG. 58
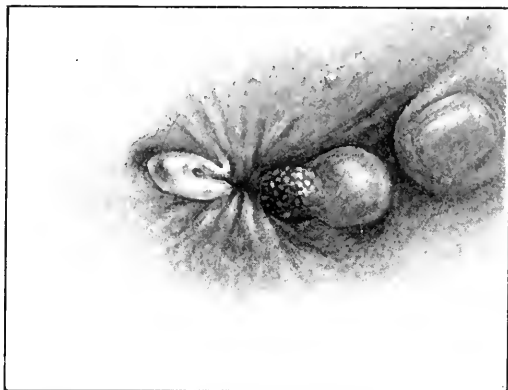
Prolapsed internal hemorrhoid with fissure. (Lynch.)

Pathology.—Dilatation of the veins, increase of connective tissue, infection, thrombosis, and sometimes abscesses due to the colon bacilli.

Symptoms.—Internal hemorrhoids may exist for years without giving rise to any symptoms other than the fact that they prolapse and bleed occasionally. Also, when the individual is very tired they may give rise to a dull aching in the rectum. When prolapsed and strangulated they cause exquisite pain and it is then that the patient usually decides to submit to treatment or operation. He may at first be able to reduce the mass, but after the hemorrhoids have existed for some time, the sphincter becomes relaxed, and, accompanied by a general prolapse of the anal mucosa, the piles remain outside of the anus most of the time.

Hemorrhoids of long duration are generally complicated by ulceration, fissure or hypertrophied papillæ, and increased secretion of mucus.

If a fissure is present, intense pain is experienced when the bowels move, and lasts anywhere from a half hour to several

7

hours after. This aggravates the hemorrhoidal condition, and, if allowed to take its course without treatment, may result in an abscess.

Hemorrhoids of the prolapsing externo-internal variety usually occur singly, anteriorly or posteriorly, protrude every time the bowels move, become engaged in the sphincter, and a little blood is squeezed out each time. This latter may be projected with great force, or just a few drops at a time, depending much on the size of the hemorrhoid and the extent of the ulceration.

Diagnosis.—An impression seems to prevail among medical men that a diagnosis of internal piles can be made by digital examination. This is far from the truth, since in the majority of cases the hemorrhoidal mass disappears, temporarily, under pressure of the examining finger. If, however, the hemorrhoids have existed for a long time and thrombosis has occurred as a result of inflammation, then the diagnosis can be made by the finger. We occasionally see cases where the hemorrhoids have undergone fibrous degeneration. The condition then assumes the character of a polypus and can readily be made out by a digital examination.

Inspection is the only safe method of diagnosis. This may be accomplished by having the patient assume the squatting posture and then bear down, or by giving an enema of water, and having the bowels move, when the hemorrhoidal mass comes into view. By far the surest and best method is by inspection through the anoscope. A suction apparatus is used by some; but we have tried it, and found that the inconvenience following its use is hardly justified by the knowledge obtained; especially as other means give better and surer results.

Treatment.—The cause must be sought in every case and then suitable treatment instituted. This may seem trite, but we can hardly expect to accomplish a cure until we have established the cause.

We must here digress to point out the mistakes that result from the carelessness of the physician, and are often fatal to the patient. For example, after a mere inspection of the parts the physician prescribes some ointment and waits for this and nature to do the rest; or, still worse, the patient's own diagnosis is taken

without any examination. Hemorrhoids are often only a manifestation of an organic trouble. We are all apt to be careless, at times, and to be satisfied if we can find one pathological condition to account for the symptoms, and the general practitioner is not the only one who makes mistakes. He is very often asked to bear more than his share of the blunders that are made, for specialists themselves are often at fault in like manner. We recall a case that was operated upon for hemorrhoids by a surgeon of no mean ability, and the fact that the patient had cancer was discovered only when he recovered from his hemorrhoidal condition. We should all learn from our mistakes, and it is only the man who does not profit by them that is really culpable.

FIG. 59
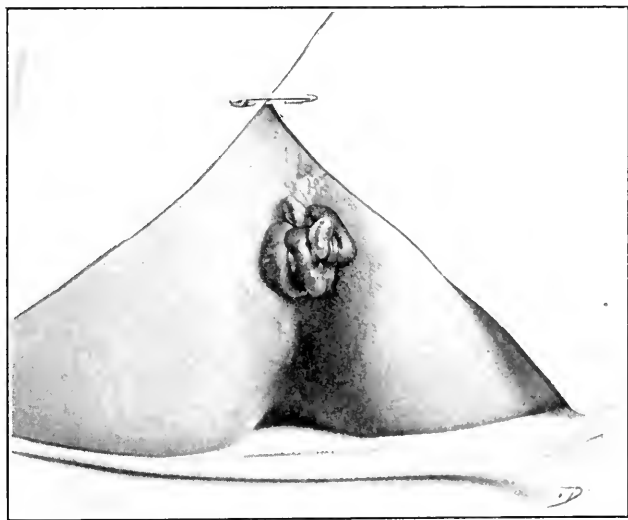
Prolapsed internal hemorrhoids showing hypertrophied and inflamed papilla.
(Lynch.)

It is well in every case, no matter how sure we are that the hemorrhoidal condition is the true cause of the trouble, to institute a thorough and searching examination of the rectum, sigmoid, liver, and heart. It would be preposterous to operate upon a hemorrhoidal condition caused by cirrhosis of the liver, or associated with an ataxia; likewise it would be worse than useless to operate for piles in a patient suffering from cancer, stricture, or

intussusception. Any of these conditions may be the cause of the hemorrhoids, and only when these are relieved can we expect to cure the resultant condition.

Having established a purely hemorrhoidal condition, the question follows—what treatment should be instituted? Very often, in the early stage, it is sufficient to regulate the patient's diet, put a ban on violent exercise, order an ointment of stramonium, belladonna, and tannic acid, and the injection of a little cold water before the bowels move. The patient must also be warned not to strain at stool.

Fig. 60

Prolapsing internal hemorrhoid. Serpiginous syphilide of the gluteal region. (Lynch.)

But there are different kinds of internal hemorrhoids, and the same treatment does not apply in all conditions. For instance, there is the prolapsing internal pile (Fig. 59) that bleeds a great deal when the patient's bowels move, and is constantly coming down. The mucous membrane is generally ulcerated, and the con-

dition is a potential abscess; it is really an externo-internal hemorrhoid. When such a condition is once established, and the patient is being constantly debilitated by hemorrhage, nothing short of a radical surgical procedure should be thought of. Otherwise, the disorder often results in marked anemia. I have seen a number of cases where the hemoglobin was as low as 35 per cent., and the patient almost on the verge of collapse, and yet the condition can readily be relieved by a simple surgical procedure.

Accepted Methods of Operating.—These are *clamp and cautery, ligature, Whitehead's*, and the *injection treatment*.

CLAMP AND CAUTERY.—I have a predilection for the clamp and cautery in the majority of cases, and the Whitehead operation in selected cases. No man can adopt these two operations nowadays, however, unless he is prepared to defend his position. Personal statistics count for nothing in the eyes of our opponents, as they are willing to furnish the necessary statistics to back their own arguments. But, after a personal experience with about a thousand cases of clamp and cautery operation, extending over a period of ten or twelve years, I am perfectly satisfied with the results. As to the advantages of this method over that of the ligature and its modifications, the best argument I can advance is that offered by the House Surgeon[1] of St. Mark's Hospital, London, the home of the ligature operation. One hundred and fifty cases were operated upon by the ligature, 100 by the Whitehead, and 50 by the clamp and cautery:

Pain.—Clamp and cautery: severe, none; moderate, 30 per cent.; very little, 70 per cent. Ligature: severe, 10 per cent.; moderate, 57 per cent.; little, 33 per cent. Whitehead: severe, 16 per cent.; moderate, 56 per cent.; little, 28 per cent.

Catheterization.—Ligature, 10 per cent. required catheter; Whitehead, 6 per cent.; and clamp and cautery, none.

Control of the Sphincter.—After the clamp and cautery operation, control returned on the average on the sixth day; after the ligature operation, on the tenth day; and after the Whitehead operation, on the fourteenth day.

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[1] The After-results of the Operative Treatment of Hemorrhoids: A Study of 300 Cases, by H. Graeme Anderson, M.B., St. Mark's Hospital.

Contraction of the Anal Canal.—Not one in the clamp and cautery cases showed the least tendency to contract. In the ligature cases 4 per cent. showed some contraction, in 5 per cent. marked contraction. In the Whitehead cases 56 per cent. showed a tendency to contract, and in 9 per cent. there was decided contraction.

Development of Tabs.—Clamp and cautery operation, 50 per cent.; ligature, 40 per cent.; Whitehead, 70 per cent. In 6 per cent. of the clamp and cautery, 15 per cent. of the ligature, and 5 per cent. of the Whitehead, the tabs required removal afterward.

Hemorrhage.—In 1 clamp and cautery case bleeding occurred, due to the carelessness of the nurse; in no Whitehead case was there early hemorrhage, but there were 2 cases of secondary bleeding; after the ligature operation there was 1 case of hemorrhage, due to the patient interfering with the dressing.

Abscess, Fistula, and Ulcer.—None complicated the clamp and cautery operation. A partial abscess followed by a fistula occurred in 1 of the ligature cases. A small fistula and 2 cases of chronic infectious ulceration followed the Whitehead operations.

Recurrences.—1 after ligature; and 1 following an Earle operation.

Duration of Treatment.—Clamp and cautery cases remained in the hospital on an average of ten days; ligature cases, twenty-one days, Whitehead cases, twenty-six days.

I shall rest my case on this analysis by the House Surgeon of the largest hospital devoted solely to the treatment of rectal diseases, where the ligature operation is practised almost exclusively, and where there is the greatest prejudice against the clamp and cautery operation. The figures speak for themselves.

On the Care of the Cautery.—We hear so many complaints from time to time concerning the uncertainty of the Pacquelin cautery that a few words concerning the care of this instrument may be helpful. We know from experience that if the Pacquelin cautery is properly cared for it will always be in working order when needed.

The instrument has a thick platinum end which is most essential. First, it is important, before use, that the tip should be brought to a red heat in the flame of an alcohol lamp or gas jet

before the benzine is pumped in. Secondly, after use it should be brought to a white heat and the bulb suddenly removed. If this is done the heat in the platinum will be sufficient to consume the surplus benzine and the cautery is ready for use when needed again. If this is not done the benzine causes the formation of a deposit, which prevents the platinum from working the next time; in such a case the tip of the cautery should be heated for five or six minutes in the flame of an alcohol lamp until all the carbon is burned up. If these points are observed, trouble with the cautery will be obviated.

Technique of Clamp and Cautery Operation.—The patient having been prepared and anesthetized, the sphincter is gradually dilated. When this has been accomplished, the hemorrhoids prolapse and come into view. With a pair of hemorrhoidal forceps the tumor on the right side is seized and held to the left. The operator now determines how much skin should be removed, and cuts through until the mucous membrane is reached. The object of this is to avoid burning the skin when the cautery is applied, as a skin burn is very painful. The hemorrhoid is now pulled down and the clamp used, care being taken that the heel of the clamp embraces the upper portion of the tumor. The object of this is to apply the greatest pressure where the bloodvessels are. The instrument should now be firmly fixed by the screw so that there is no danger of slipping. Downward pressure of the hand holding the clamp will cause its heel to tilt up and thus make it easier to apply the cautery. By means of a pair of scissors, curved on the flat, the pile is cut off an eighth of an inch from the clamp, and the stump is thoroughly cauterized with the Pacquelin. Plenty of time should be taken with this process as it is important that the stump should be most thoroughly seared to prevent subsequent hemorrhage.

Attention should be called to the necessity for having the cautery at a dull red, instead of at a white heat, as the latter only cuts and does not char. Before removing the clamp, sodium bicarbonate is rubbed into the charred tissue.

The screw should be gradually loosened and the clamp withdrawn, allowing the seared stump to recede into the rectum. The other hemorrhoids are treated in the same manner until all have

been removed. A Humphreys' speculum is now introduced, and the rectum carefully inspected for hemorrhage. Before withdrawing the speculum, a Lynch tube is inserted to keep the sphincter dilated, and allow the gas to pass out, which saves the patient a great deal of subsequent pain. Also, if hemorrhage should occur, it can readily be detected by leakage through the tube. An injection of olive oil can be given, through the tube, before it is removed. Sterile gauze is wrapped around the tube and over this some fluffed gauze placed. The buttocks are then strapped together by means of Z. O. plaster and the patient returned to bed.

Before the patient recovers consciousness $\frac{1}{4}$ grain of morphine is administered hypodermically, which will tide him over the most painful period, and he may not require more. We do not believe in allowing our patients to suffer after this, or any other rectal operation, unless there is some contra-indication to the use of morphine. In that case we use some such substitute as the following:

```
℞—Acetanilide,
    Phenacetin  .  .  .  .  .  .  .  .  .  .  .  .  āā   gr. ij
    Codeine,
    Caffeine  .  .  .  .  .  .  .  .  .  .  .  .  .  āā   gr. ⅛
Make one powder.

℞—Pyramidon  .  .  .  .  .  .  .  .  .  .  .  .  .  .  gr. v
    Citrated caffeine
    Codeine  .  .  .  .  .  .  .  .  .  .  .  .  .  .  āā   gr. ⅛
Make one powder.
```

There is one drawback to the clamp and cautery, according to the statistics of Mr. Anderson; but this can readily be avoided. For years we have advocated the thorough removal of redundant skin at the time of observation. In fact, we have made it a point to impress on our students that it is much worse to remove too little than too much skin. The skin is very elastic, owing to the conformation of the parts, and the surfaces readily come together and obliterate the space; whereas, if the skin is not thoroughly removed, tabs are almost certain to result and, with the edema following the operation, cause the patient much more pain and discomfort (not only during convalescence, but long afterward) than the original condition for which he was operated upon.

This apparently is the only drawback. I am aware that Lilienthal has advocated multiple radiating incisions of the skin at the time of operation, but this is inferior to actual removal. In our own experience and in that of Dr. Tuttle, the clamp and cautery in the majority of cases is by long odds the most satisfactory operation, not alone for the expert, but also for the man who does an occasional operation. However, it is not only the operation, but the

Fig. 61
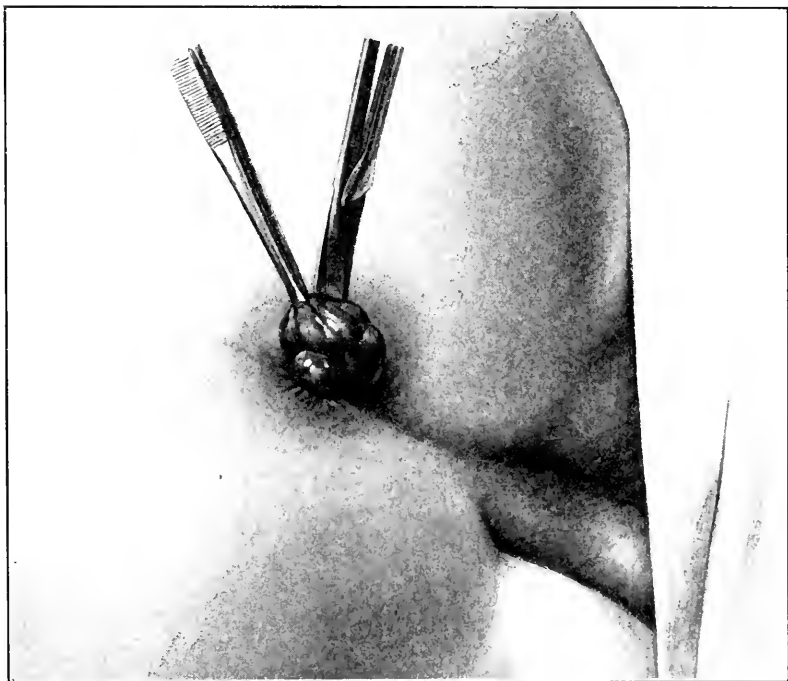
Large external thrombotic hemorrhoids with ulcerated internal hemorrhoid. Method of removal under local anesthesia. First step after anesthetization. (Lynch.)

subsequent care that counts for good results in all rectal operations. When a hemorrhoid is removed we have a raw surface. Owing to the tendency of the canal to contract, two raw surfaces exist where each hemorrhoid is removed. In other words, when the sphincters contract, these cut surfaces are brought together and firm union ensues, with stricture formation, unless constant

dilatation with the index finger is kept up. If all surgeons paid
as much attention to the after-treatment of their hemorrhoidal
cases as they do to the preparation, they would have far better
results and fewer complications.

LIGATURE OPERATION.—There are several ligature operations;
but the one suggested by Matthews, of Louisville, is perhaps the
best.

FIG. 62
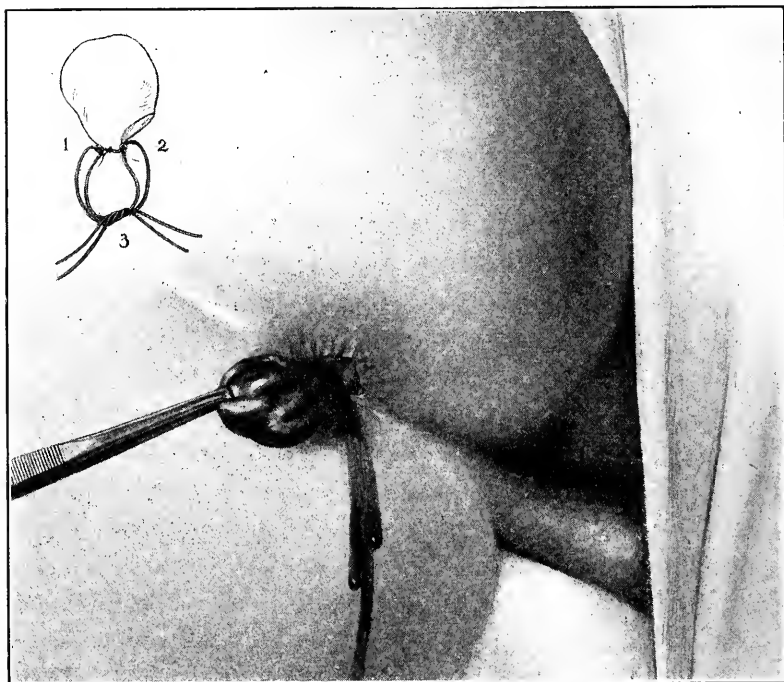
Large external thrombotic hemorrhoids with ulcerated internal hemorrhoid.
Diagram at left showing the ligature in place and method of tying. (Lynch.)

Matthews' Technique.—The patient having been prepared in
the usual manner and anesthetized, the sphincter is gradually
dilated. Each hemorrhoid is grasped with a pair of strong artery
forceps and brought into view. The right posterior hemorrhoid
is first treated as follows: A needle is threaded with No. 2 chromic
catgut, about 6 or 8 inches long—the catgut being pulled through
the needle until the two ends are equal; with this needle the
base of the hemorrhoid is transfixed; after the suture is pulled

half way through, the ligature is cut and the hemorrhoid ligated
on both sides. Afterward the hemorrhoid is cut with scissors,
care being taken to leave a stump of at least $\frac{1}{8}$ inch. Each hemor-
rhoid is treated in like manner.

Fig. 63

Inflamed external thrombotic and prolapsed internal hemorrhoid. Removal
under sacral anesthesia. Drawing made at time of operation. (Lynch.)

Another method of doing this operation is as follows: The
hemorrhoid is brought down as before described; the skin is cut

so as not to include it in the ligature, and around the base of each tumor a ligature, preferably of linen or silk, is thrown, and the hemorrhoidal mass tied off. Some cut the hemorrhoid off afterward; others allow it to remain and come away with the ligature. The ligatures come away about the seventh or tenth day if nonabsorbable material is used. Finally, we introduce a Humphreys' speculum and insert a Lynch tube; pack gauze about the tube

FIG. 64
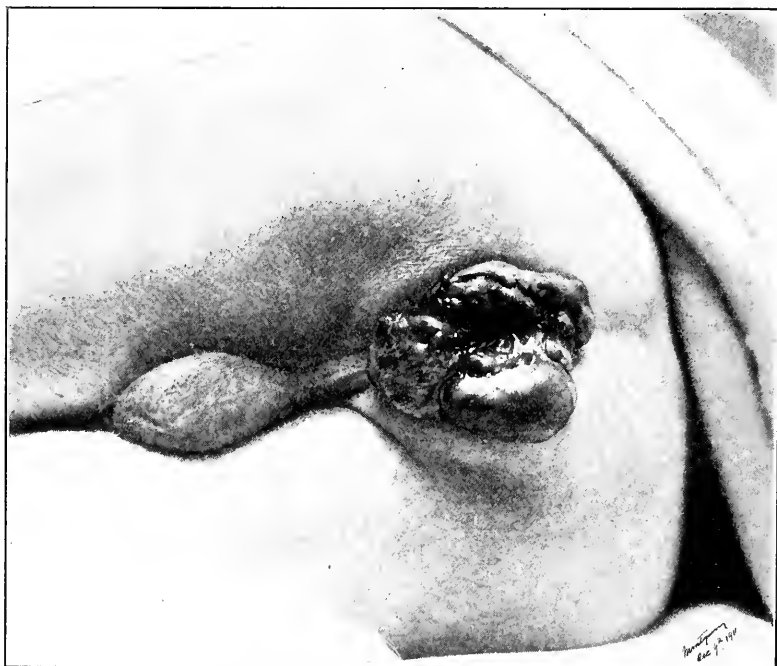
Prolapsed and inflamed internal hemorrhoid with inflamed external hemorrhoid. (Lynch.)

and strap the buttocks with adhesive. As in the clamp and cautery operation, the bowels are confined for four days, and then an injection of olive oil is given through the tube, with the patient in the knee-chest position, and the tube immediately removed. He is encouraged to retain the oil for an hour or two, for the purpose of softening the fecal mass accumulated in the rectum and sigmoid since the operation. If this is insufficient,

another enema is given, and $\frac{1}{2}$ ounce of Laxol castor oil by mouth; or if this is not tolerated, some other laxative, as fluidextract of cascara, ℥j.

After removal of the dressings and tube from the anus, hot, moist applications give much relief; a gauze compress, saturated with warm saline, is applied, and over this a hot-water bag placed and allowed to remain. Applying the bag to the back is sometimes also effectual.

THE WHITEHEAD OPERATION. — This operation was first described by Mr. Whitehead, of Manchester, England, in 1882. Since that time it has undergone so many modifications, by different operators, that it would be difficult to find any likeness between the original and the present technique. Yet the idea originated with Mr. Whitehead, and no doubt the operation will always be known by his name, so long as it is in vogue.

Since Mr. Whitehead published his first article on the subject the operation has evoked the liveliest discussion among surgeons all over the world. It has the support of some of the most eminent men in the profession, and is condemned by others equally prominent. Probably more has been said for and against this operation than any other, except, perhaps, the suggestion of Sir W. Arbuthnot Lane to remove the entire colon in cases of auto-intoxication.

We have had an extensive experience with this operation, and we believe, notwithstanding the adverse criticisms, that it has its place in surgery and has come to stay. The great trouble with the Whitehead, as with so many other operations, lies, we believe, in the unfamiliarity of the operator with its technique. It is our opinion, too, that this operation is often performed when a more simple procedure would give the same relief; and that, if it were done only in those cases where it is indicated—that is, where there is a redundancy of the mucous membrane and numerous prolapsing hemorrhoids—there would be very little objection to the procedure. All operations have some drawback, and a certain percentage of cases will be followed by unfortunate results. A surgeon who merely does an occasional hemorrhoidal operation should not attempt a Whitehead. It is a procedure that should only be undertaken by those who are constantly

operating in hospitals, and so have opportunity to become adept. The best results we have ever had in hemorrhoidal work have been those following this operation. We recall one case where, owing to loss of blood by hemorrhage, and from constant worry, a prominent railroad official was incapacitated. Ten days after a Whitehead operation he left the hospital in good condition, was back at work three weeks later; he gained thirty pounds within a short time, and has never had any trouble since. We could cite many cases where good results were obtained following a White-head; but we instance this one, because we feel certain that if any other operation had been performed entailing prolonged after-treatment, the patient would have been kept from his duties for two months, and there would have been great difficulty in persuading him to come for the frequent dressings which are so necessary; whereas, by this procedure, primary union was obtained, and the patient was able to go into the country on leaving the hospital, and was so well at the end of three weeks that he could return to his desk without risk.

Description of the Operation.—Method.—The preliminary cleansing of the bowels must be very thorough. The patient having been otherwise prepared and anesthetized, the sphincter muscle is dilated and some pure peroxide of hydrogen injected into the rectum, and followed by alcohol, or pure formalin followed by hydrogen peroxide. A transverse incision is made at the muco-cutaneous junction in the posterior commissure. A pair of scissors with rounded ends and curved on the flat is now passed into the incision and by blunt dissection carried above the hemorrhoidal area. The scissors are gradually worked around to one side and then to the other side until the entire hemorrhoidal area has been lifted from its base. The incision is next carried around the entire circumference of the bowel, and the mucous membrane, thus separated from the skin, is held by means of four to six forceps. The external sphincter muscle, which now comes into view, is carefully pushed back until sufficient healthy tissue above the hemorrhoidal area has been brought outside, so that it can be sewn to the skin without tension. And in this process care must be exercised not to remove or seriously damage fibers of the internal sphincter. An incision is next made upward

through the mucosa in the posterior commissure until healthy tissue is reached. With a needle, threaded with No. 4 catgut, 6 inches long, a suture is taken through the mucous membrane and skin and tied. Next an incision is made at right angles to the first about $\frac{1}{2}$ an inch long. The assistant, by pulling out the detached mucous membrane with thumb forceps, brings the healthy mucous membrane and the skin in apposition; then with an overhand stitch the operator procedes to sew the mucous membrane to the skin. This is continued until the anterior commissure is reached where the suture is tied; the object of this being to prevent stricture for, if the entire circumference were surrounded by one suture, narrowing might occur. The operator returns now to the posterior commissure and repeats the same procedure on the other side. If any spurting bloodvessels are found—and this generally happens when the mucous membrane is cut—a mattress suture is used to control them. A Humphreys' speculum is then passed into the rectum and the sphincter gently stretched, after which a Lynch tube is inserted and covered with sterile gauze. The buttocks are strapped together with two or three pieces of Z. O. plaster to keep the tube in place, and the patient is returned to bed and placed on his left side with limbs extended.

Lynch's Modification.—An incision is made in the posterior commissure. The operator with a pair of thumb forceps catches the mucous membrane and proceeds to separate it from the skin entirely around the anus by means of scissors, curved on the flat. The mucosa is then caught by T-forceps and the operator proceeds carefully to dissect the pile-bearing area until healthy structures are reached and sufficient healthy membrane can be brought down to obviate tension. Two assistants, one on either side of the operator, hold the cuff of the mucosa taut, and by means of a continuous mattress suture it is stitched to the skin. In this way all bleeding is obviated. A Humphreys' speculum is inserted, then a Lynch tube; and afterward the buttocks are strapped.

After-treatment.—After the patient has been returned to bed, $\frac{1}{4}$ grain of morphine is given hypodermically, if the patient has had no morphine previous to the operation; otherwise only a small dose is given to relieve pain. Afterward we use deodorized

tincture of opium, 10 minims three times a day, to tie up his bowels and keep him comfortable. The tube is removed at the end of forty-eight hours. Cream of tartar powder is dusted over the wound to keep it dry and prevent infection. At the end of the fifth day the patient is given an injection of olive oil, about 8 or 10 ounces, and, after this has been expelled, the rectum and sigmoid are washed out with a warm saline solution. The patient is next given $\frac{1}{2}$ ounce of castor oil, $\frac{1}{2}$ dram of cascara, or other cathartic. After the bowels have moved, two catheters are inserted into the rectum, a smaller one for inflow for $1\frac{1}{2}$ inches above the anus, and a larger one for outflow just inside the external sphincter. The tip of a fountain syringe is now attached to the inflow catheter and the rectum washed out with a quart of warm saline solution. Later, until the parts are thoroughly healed, the rectum is washed out after each dejection. If there is any suppuration or pulling of the stitches, the wound should be washed out, twice daily, with 30 per cent. solution of gelatine. Sometimes a saturated solution of cream of tartar will work equally well.

INJECTION TREATMENT.—This method is not popular, owing to the fact that it has been exploited by quacks. Since, however, it has been taken up seriously by the regular profession, very good results have been obtained in the hands of careful men. There are certain cases that need relief, but wherein, owing to some contra-indication, none of the other methods can be employed. Under such circumstances there is no reason why the injection method should not be tried.

Our technique is as follows: After the patient has been properly prepared and the canal washed out with peroxide of hydrogen, a speculum is introduced and held in place by an assistant. The hemorrhoid to be injected is selected, and 3 to 5 minims of a 5 to 10 per cent. solution of carbolic acid are injected into the hemorrhoid as the needle is withdrawn. A piece of gauze saturated in alcohol is applied at the side of the puncture, and held there for some time to neutralize any phenol that may escape. The patient is instructed to remain quiet for a day, and, if the hemorrhoid should prolapse, he is instructed *to return at once.* Five days later another pile is selected, and so on until all have been

treated. It is sometimes necessary to inject a hemorrhoid more than once; but by care, patience, and perseverance, the entire hemorrhoidal zone can be obliterated, and good results obtained. This method is not as satisfactory as the more radical operations because recurrences are more frequent, and the patients are then obliged to return and undergo another ordeal.

INDICATIONS FOR LOCAL ANESTHESIA IN THE SURGICAL TREATMENT OF HEMORRHOIDS.

Local anesthesia can be used in the removal of the following:

1. External hemorrhoids.

2. Prolapsing strawberry internal hemorrhoid.

3. Prolapsing internal hemorrhoids when they have existed for some time.

The question of local anesthesia is discussed in another chapter (page 46), so that it will only be necessary, here, to outline briefly the technique to be followed in the different conditions enumerated above.

The patient, previously prepared as for any aseptic surgical operation, is placed on his left side in the Sims' posture. A syringe which contains one ounce of anesthetic solution is used with a needle about half an inch long and fairly stout; this is important, as a weak needle may break off and cause intense distress to the patient and great chagrin to the operator. The hemorrhoid which is to be removed is selected and a drop of carbolic acid on the tip of a probe is placed on the skin about an eighth of an inch from the hemorrhoid. The skin on either side of this spot is picked up between the forefinger and thumb, and the needle inserted at the spot where the carbolic acid was applied. The skin is then released and a little of the anesthetic slowly injected. It is better to wait for a time now before proceeding further. After the patient has quieted, assuming that he is somewhat disturbed by the puncture, the operator proceeds to inject the solution at the base of the hemorrhoid, continuing until the internal margin of the pile is reached. It is well to inject the solution about an eighth of an inch above the hemorrhoid, so that if the operator should remove more than at first

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anticipated, he will not cause the patient unnecessary pain. No matter what anesthetic has been used for preliminary work, we think that cocaine in the strength of 0.5 to 1 per cent. should be used for injection into the body of the hemorrhoid. This is done by inserting the needle at the original puncture, and, as it is passed into the body of the hemorrhoid, about 10 minims is deposited there. The object of using a strong solution of cocaine in the body of the hemorrhoid is to avoid overdistension and the removal of unnecessary tissue. The hemorrhoid is next grasped with artery forceps, or thumb forceps with teeth, and the surgeon proceeds to remove the pile usually by the ligature or by the clamp and cautery operation.

If the operation of Mr. Whitehead is preferred, the procedure is a little different. In this case it is better to inject the solution all around the anus at the juncture of the mucous membrane with the skin, and afterward inject the body of the hemorrhoids by deep punctures, depositing about 10 minims of the solution at each puncture. The above applies to internal or externo-internal piles; if external only, the same procedure is followed so far as the injection of the anesthetic is concerned, but the removal is accomplished by simple excision.

COMPLICATIONS FOLLOWING HEMORRHOIDAL OPERATIONS.

Hemorrhage.—Hemorrhage, while not a frequent complication, does occur occasionally after all rectal surgery. Personally, we have never had any serious results from hemorrhage following these operations. We had one following a ligature operation which was somewhat alarming. The rectum afterward filled with blood clots, and it took several quarts of saline to clean it out, but the hemorrhage was easily controlled by means of gauze packing, and the patient, who, by the way, was a doctor, made an excellent recovery.

In another case hemorrhage occurred following a clamp and cautery operation, but was also easily controlled, and the patient suffered no ill effects.

A third case occurred in the practice of an eye and ear specialist.

He had performed this operation in a hotel in New York, and on the second day the writer was summoned and told that the patient was dying from hemorrhage, and that the physician had used every means in his power to control it, but without success. On arriving we found the room covered with blood, and the doctor and nurse so alarmed that it was impossible for a few minutes to get anything done. Finally the patient was brought to the edge of the bed, and a Sims' speculum was passed into the anus, when a gush of blood and clots were ejected with great force. The rectum was washed out with a saline solution, but the bleeding had subsided and there was no cause for further alarm. However, in order to satisfy the physician in charge, we replaced the packing which was removed after twenty-four hours. The patient made an uneventful recovery.

Hemorrhage is usually due to loosening of the thrombus, by straining of the patient after operation; or it may be due to slipping of the ligature following the ligature operation. In some cases it is due to the fact that the operator has overlooked some small bloodvessel on account of the infolding of the mucous membrane over it, or because he thought he could control it by means of pressure. Then, again, some individuals bleed very easily, either on account of the diminished coagulability of the blood or some vasomotor disturbance.

Secondary hemorrhage is a very rare condition, so far as our experience goes. We had one case, though, which occurred two weeks after operation. The patient was a very stout woman, weighing about 220 pounds, and had suffered for years from hemorrhoids and fissure. The piles were removed by means of the clamp and cautery, and the muscle was cut out to relieve the fissure; a Lynch tube was placed in position, and the patient got along nicely, the bowels moving on the third day. Following this she had a great deal of sphincteric spasm, on account of which, and her nervousness, she was kept in the hospital longer than usual. At the end of the second week, when ready to go home, the house surgeon notified us that the woman was having a sharp hemorrhage and asked us to get to the hospital as soon as possible. We arrived to find a very severe hemorrhage indeed. Gas was administered at once, and an examination made, but

the hemorrhage had ceased. The bowel was irrigated thoroughly with saline solution, but no packing introduced. The patient made an uneventful recovery.

We have seen a few cases in the practice of other men; but, when we consider the infrequency as seen in the last ten years in the service of three of the largest clinics in New York, the percentage is very small; and as no fatalities occurred, we only mention them in order to point out what should be done, and to show that such accidents will happen, no matter what operation is performed. There are some fatal cases recorded in literature; Mr. Edwards mentions one, but, so far as we know, no such result has ever occurred in our own practice or in that of our associates.

We are inclined to agree with the late Professor Ingals, of Chicago, who used to say that he always felt relieved when a patient fainted after a sharp hemorrhage following the removal of the tonsils, because the hemorrhage was then sure to stop. Our own experience is entirely in accord with that of Dr. Ingals. After the patient has lost a certain amount of blood he generally faints and the pressure is so reduced that a thrombus is formed.

Treatment.—If the hemorrhage is active it is well to lose no time. The patient should be anesthetized immediately, unless his condition forbids. In either case a Humphreys' speculum is passed into the rectum, and the bowel washed out rapidly with a normal salt solution, either very warm or very cold. After the clots have been removed, further bleeding must be prevented. A piece of gauze, about two yards long and three or four inches wide, and of two thicknesses (such as is generally used in hospitals), is selected and to this a stout piece of tape is tied at the top. The tape is now wound around the gauze, and, with dressing forceps, the gauze is packed into the ampulla of the rectum and the speculum is withdrawn. Two fingers are placed close to the anus, and between them the tape is pulled taut. In this way the gauze is gradually drawn into the folds until finally it fills the ampulla of the rectum just above the anus. The outside portion of the tape is now attached to another piece of gauze and the gauze is rolled on the string until the anus is reached, thus forming an inside and outside tampon, which firmly compress the bleeding

vessel. This is a most effectual means of stopping hemorrhage, and the gauze is allowed to remain in place for twenty-four hours. At the end of that time it is removed under an anesthetic; or, if the patient is not very sensitive, without the anesthetic. It will be found that no further hemorrhage will occur.

Some men spend a great deal of time trying to get the bleeding point and to ligate it; but this is a very difficult process (as we know from experience) and causes the patient much unnecessary pain or unduly long anesthesia. The vessel is hard to discover because the blood keeps welling up, and the ligature is no more effectual in the end than the other method we have suggested. Adrenalin chloride, 20 to 30 drops, 1 to 1000, injected into the rectum will sometimes control hemorrhage.

Spasm of the Sphincter.—Spasm of the sphincter occurs in a certain percentage of cases following operation. Usually the condition existed before operation—as the result of fissure or ulceration of the hemorrhoids—and lasts for some time after the operation, but generally it subsides at the end of the second week. Applications of moist heat or cold will relieve the trouble, together with one of these ointments:

$$
\begin{array}{lll}
\text{R—Ichthyol} & \ldots\ldots\ldots\ldots\ldots & \text{gr. xxv} \\
\text{Anesthesine} & \ldots\ldots\ldots & \text{Ʒss} \\
\text{Argyrol} & \ldots\ldots\ldots & \text{Ʒj} \\
\text{Vaseline} & \ldots\ldots\ldots\ldots\ldots\text{q. s. ad} & \text{Ʒj—M.} \\
\end{array}
$$

$$
\begin{array}{lll}
\text{R—Ungt. belladonnæ} & \ldots\ldots & \text{Ʒj} \\
\text{Ungt. ichthyol} & \ldots\ldots\ldots\ldots & \text{Ʒiv} \\
\text{Vaseline} & \ldots\ldots\ldots\ldots\text{q. s. ad} & \text{Ʒj—M.} \\
\end{array}
$$

Abscess.—An abscess may, rarely, follow a hemorrhoidal operation. Should infection follow, it may be local or diffuse. We have seen a superior pelvirectal abscess, with extensive burrowing, result from a Whitehead operation; fortunately, not in our own hands. We have also seen an ischiorectal abscess result from the injection of a hemorrhoid with some preparation, presumably carbolic acid, which we were called to open four days after the man had been treated by an advertising specialist.

Murphy relates a case that came under his observation at autopsy, where multiple abscesses of the portal system had resulted from the ligature operation.

When infection follows a hemorrhoidal operation, it is usually ushered in by a marked chill, and rise in temperature, sometimes as high as 105° F., restlessness, and local pain. Under such circumstances, thorough search should be made, and when the infected focus is located, it should be properly drained to prevent spread of the infection.

Edema of the Skin.—Edema of the skin is likely to follow a hemorrhoidal operation if the skin has not been completely removed. When this occurs, it is exceedingly painful and is apt to be followed by spasm of the sphincter. Besides the pain and inconvenience to which the patient is subjected, the after-treatment is slow and tedious. When edema occurs, warm applications, in the manner described for the local treatment of hemorrhoids, will be found effectual.

Delayed Healing.—In some cases, owing to the general condition of the patient, spasmodic condition of the muscle, or some other cause, the healing of the wound is delayed, and the patient suffers considerable pain. The surgeon should keep a watchful eye on such individuals, stretch the sphincter from time to time, if necessary, to relieve the spasm, and make applications of 1 per cent. of nitrate of silver and 10 per cent. icthyol ointment, or a mixture of 10 per cent. argyrol, 5 per cent. ichthyol, and vaseline enough to make an ounce. Such ointments are very stimulating and soothing. Without this careful supervision a fissure is apt to result. We have seen this occur in one or two cases, but not in our own practice. It will also happen in cases where the patient is not seen by the surgeon frequently, or when the patient is discharged before the wound is entirely healed. The only remedy is to give the patient a general or local anesthetic and divide the muscle to secure rest; afterwards the fissure is treated by the usual applications which are mentioned in the chapter on Fissure (Chapter VI).

We have seen cases in the dispensary where a fistula resulted from a hemorrhoidal operation, or perhaps it would be more correct to state that it was due to neglect of the postoperative treatment. It is quite possible that in some cases the fistula existed coincidently with the hemorrhoidal condition, and was overlooked at the time of the operation; and we know of one

or two cases where a fistula resulted from an unhealed fissure, which became infected following a hemorrhoidal operation. The treatment is outlined in the chapter on Fistula.

Stricture.—Anal strictures occur in a small percentage of cases following removal of hemorrhoids, but, except in the Whitehead operation, we believe it is due entirely to after-treatment.

There is always a certain amount of narrowing following the Whitehead operation, but it amounts to nothing if the operation has been properly performed. If infection follows a Whitehead, it is almost certain to result in stricture. When it does occur the proper treatment consists in dilating the anus by means of the finger or by passing a Wales bougie from time to time, and gradually increasing the size. Where the stricture is pronounced, as it was in one case which we saw in consultation, it may be necessary to do a posterior proctotomy.

Pruritus.—Pruritus is a very troublesome complication, which sometimes occurs during the healing period following an operation for hemorrhoids, and sometimes continues long after the wound is healed. In most cases it comes on about the time when the epithelium is forming, and is due to the discharge from the rectal wound; but, by keeping the parts washed out with warm water, and instructing the patient to keep them thoroughly dry by means of talcum powder, the condition should disappear after the wound is healed. When it persists, we believe it is due to the formation of scar tissue causing irritation of the sensory nerves of the skin, or else to some local condition not in any way connected with the operation.

Retention of Urine.—Retention of urine, spasm of the neck of the bladder, and painful urination follow rectal operations in about 75 per cent. of cases. If we understand the closely related nerve control we can more readily realize why this happens. The inferior hemorrhoidal nerves which supply the external sphincter are given off from the pudic, in most cases; and, as the pudic nerve supplies the branches to the neck of the bladder, irritation at one end is bound to be reflected and cause spasm at the other. Spasm of the anal sphincter is the rule after rectal operations, and, during attempts at urination, reflexly excites violent spasm

of the vesical sphincter, and so frightens the patient that the act is put off as long as possible; the bladder becomes distended, making it still more difficult to void the urine. Such retention is more common in males than in females.

We have seen retention follow an abdominal operation which had no connection with the rectum. On investigation we found that the patient had a very tight sphincter, and that, when gas accumulated and was not expelled promptly, he could not urinate. A very simple expedient relieved him, *viz.*, washing out his rectum with a warm saline solution. This happened three or four times, and every time the same treatment relieved him. We must, of course, in all cases be careful to eliminate stricture of the urethra, contraction of the neck of the bladder, and other genito-urinary conditions, which may not manifest themselves before operation, but which should be ascertained by a careful history taken before operation, and for which appropriate pre-operative treatment should be given.

Treatment.—A great many cases have to be catheterized for forty-eight hours after operation, and these should be put on urotropine immediately because, no matter how careful one may be, infection of the bladder is apt to occur if some such precaution is not observed. We are in the habit of allowing our patients to stand and use the commode, and we find by so doing catheterization can very often be avoided. We try first, of course, hot fomentations or hot water bags to the perineum, or over the abdomen, and all other measures that everyone is familiar with. Only when all other means have failed, do we resort to the catheter. After forty-eight hours, when the bowels have moved, the patient generally voids his urine voluntarily. Then if he should have retention, warm saline injections will nearly always relieve him, or warm sitz baths may prove efficacious.

Cystitis.—Cystitis is a very distressing complication, and does not occur very frequently. In most instances it is due to catheterization. Some cases are caused by colon bacillus infection, which is of very serious import. We have seen two such following rectal operations both of which recovered, but only after a very long and serious illness. We urge the greatest hesi-

tancy before using the catheter, and the most scrupulous cleanliness if it has to be used.

Tetanus.—Since the advent of antiseptic surgery this infection is a rare complication, and we have never seen a case in our own practice, or known of one in that of our colleagues. When it does occur, it is invariably fatal. At the first symptom of such trouble the antitetanus serum should be used immediately.

CHAPTER VI.

FISSURE OF THE ANUS.

THERE is no condition in the whole range of surgery where a lesion, apparently so insignificant, causes so much suffering; where such a disproportion exists between the symptoms and the lesion; and where the final results are so far-reaching, as in fissure of the anus. Yet, on the other hand, there is no condition that yields more brilliant results, if correctly diagnosed at an early date, and properly treated. Even in the late stages, where we see individuals that were formerly healthy reduced to physical and mental wrecks through this lesion, the most astonishing transformation can be effected if all the complications are appreciated and treated intelligently.

A fissure is a solution of continuity of the mucous membrane between the two sphincters, caused by traumatism of a hard fecal mass, or by straining. It occurs most frequently at or near the posterior commissure; occasionally in the anterior commissure in women; and, when multiple, is due to some specific condition.

If correctly diagnosed in its early stages, it yields readily to treatment; but if allowed to run its course, it becomes infected. The infection following the course of the lymphatics burrows up beneath the mucous membrane into the rectum; down toward the skin into the ischiorectal fossæ; or is carried by the lymphatics into one of the spaces anterior or posterior to the rectum, eventually terminating in abscess and fistula.

Etiology.—It is not our intention to go into the innumerable and plausible theories that have been advanced from time to time as to the etiology of fissure, but simply to mention those that we believe offer the best solution of the problem. At the same time, we think we are justified, from our experience, in suggesting a few that have not, as yet, been promulgated. The

congenital absence of the perineum, or its rupture during child-
birth, we believe accounts for the anterior location of fissures in
females. This we have personally observed in a number of cases.
These patients are usually constipated, and, owing to the lack
of support anteriorily, the fecal matter which accumulates in
the rectum bulges up into the vagina and requires a great deal
of force to expel it. Owing to the congestion, lack of support,
and the effort to expel, the mucous membrane in the region of the
anterior commisure is frequently traumatized. As a matter of
fact, under such conditions, these patients are never able to empty
the bowel thoroughly at one sitting, so that there is always
some residue, keeping up a depressing auto-intoxication, with
its resultant headache, indigestion, and anemic conditions.

Wallis believes the histological structure of the lining membrane
is responsible for this condition. "The lining membrane is not
skin and is not mucous membrane; consequently, it has not the
tough resisting power of the one nor the vascular supply (which
is a great power) of the other. Any lesion, then, in this locality
has small chance of recovery, (1) because of the scanty blood
supply; (2) because of the constantly altering dimensions; (3)
because of the contents of the interior which are constantly
passing over it."

Ball, on the other hand, believes that most cases of fissure
are due to the fact that on either side of the posterior commissure
and the anterior commissure in women, are well developed
valves of Morgagni; and that into these recesses some fecal
matter finds its way. Eventually, these deposits are forced down
by hard fecal movements, carrying the valve before it. At each
successive movement the rent is enlarged until finally it reaches
the skin, forming the so-called sentinel pile of Brodie.

Undoubtedly the primary cause of fissure is the neglect of
the individual to comply at the proper time with the demands
of nature, constipation ensuing. Constipation causes congestion;
and congestion, as we know, renders the mucous surface more
friable and prone to ulceration.

Ball suggests the following sequence of events as tending to
produce the fully formed ulcer: "During the passage of a costive
and large movement, a rent in the mucous membrane is made, or

an excoriation, the result of syphilis, dirt, or the passage of a foreign body, etc., exposes one of the delicate nerve twigs. As a result of the constant motion and distention, and by the lodgment of particles of feces in the rent, continued irritation is set up, which, in time, occasions spasm of the sphincter. The spasm once started, the irritation is increased, and so a vicious circle is established and the result is that the ulcer is never allowed to heal."

FIG. 65
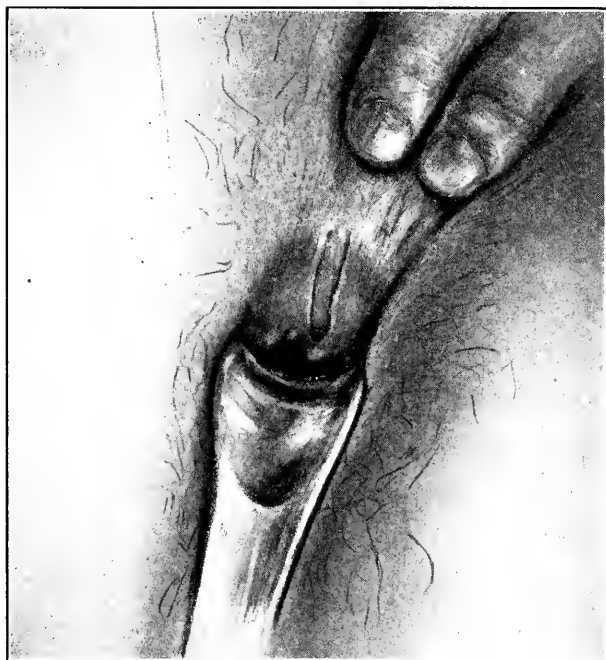
Fissure in posterior commissure showing papilla. (Lynch.)

Pathology.—At first the ulcer is superficial; the edges appear undermined on account of the spasm of the muscle causing inversion of the mucous edges; the base is generally raw and covered with blood. Later the edges become pale and indurated and the base is covered with unhealthy granulations, mucus, and pus. At this stage there is true undermining of the edges, and there are little tracts leading from the ulcer, because of the

infection and imperfect drainage. The muscle is spasmodically contracted and the mucous membrane in the vicinity is intensely congested.

The pain in the early stages of fissure is due to the traumatism of the hard fecal matter when the patient has a movement. Later on, this is increased by the indurated edges of the ulcer, being pressed in on the raw surface every time the muscle contracts.

Symptoms.—The symptoms of fissure are usually characteristic; but at times misleading. There is always some distress after a movement of the bowels; the sensation varying from a slight burning and discomfort to a sharp or dull, gnawing pain, which lasts anywhere from fifteen minutes to several hours. Some complain of pain on leaving the toilet after severe straining; pain after urination; pain in the iliosacral joint, thence shooting down the legs or into the back. These pains in women are often referred to the ovaries; in men, to the prostate.

Reflex Symptoms.—Frequent urination is a symptom that is rather common, and one that is often overlooked. Most of the patients are first treated for cystitis, inflammation of the neck of the bladder and similar conditions, especially if the pain following the emptying of the bowels is not severe. This, of course, is brought about by the constant uneasy feeling about the anus, which ends in a desire to evacuate the bladder.

Painful urination we believe to be often due to the sympathy existing between the vesical and rectal sphincters, and occurs as the last drop of urine is being expelled. The contraction of the urinary sphincter is closely followed by a contraction of the rectal sphincter, the latter being caused by inturning of the indurated edges of the fissure, and ends in severe pain, which is promptly blamed on the bladder.

Sciatica, and pains in the loins and back, are due to impressions received by the exposed sensory nerves in the ulcer being transmitted to the sciatic and iliolumbar nerves, which arise in close proximity to the trunks from which those sensory nerves are derived.

Fissure constitutes about 20 per cent. of all rectal conditions, and occurs about twice as often in women as in men. We find this true both in the cases that come before us in the hospital

and those in private practice (arguing that "the Colonel's lady and Judy O'Grady are sisters under their skin").

Fig. 66
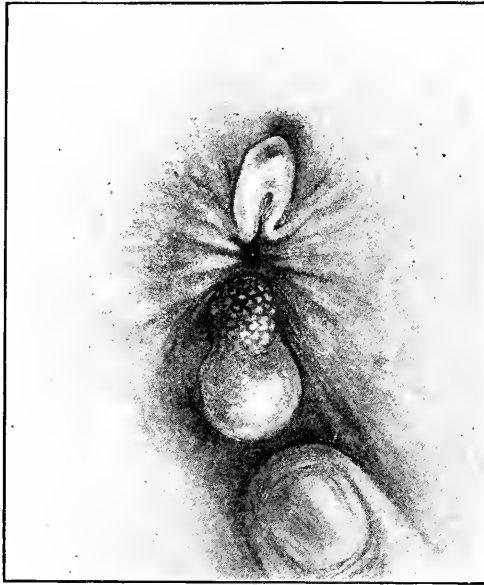
Prolapsed bleeding internal hemorrhoid with fissure.   (Lynch.)

Sequelæ.—Stasis in the lower bowel may extend eventually to the upper portion of the large intestine, with all its autotoxic consequences. It is now quite generally conceded that appendicitis is caused in the majority of cases by constipation; therefore, any lesion causing constipation has appendicitis to be reckoned among the penalties. It must be remembered, too, that all lesions involving either the rectum or the genital tract may result in neurasthenia, abscess, or fistula.

We venture to say that if a careful history were elucidated from all abscess cases that come under our observation, we would find that they had their origin in a fissure. This also applies to fistulæ.

Complications.—The most serious complication that follows a fissure is an abscess in the triangular space, followed by an ischio-rectal abscess resulting in a so-called horseshoe fistula. The

reason why fissures are so apt to result in peripheral or local infection is that there is a boat-shaped depression between the two sphincters. In this depression, pus accumulates. Therefore, the logical treatment of fissures is drainage.

Diagnosis.—The diagnosis is usually simple. The patient is placed on his left side; the buttocks are gently separated and the patient asked to bear down, when the fissure is usually brought into view. If this does not succeed, and the sense of touch is not well developed, a Sims' speculum should be introduced, with a reflected light, when the fissure can be readily seen.

There may be hyperesthesia due to a line of congestion of the mucous membrane associated with spasm of the sphincter and simulating very closely a true fissure. Such conditions are always aggravated by exercise, standing for a long time, or anxiety of any sort; but can readily be relieved by applications of pure ichthyol.

Sometimes the speculum will fail to reveal the ulcer, owing to the fact that it is covered by a hemorrhoid, or an edematous projection of mucous membrane. In such cases, when convinced that a fissure exists, it will be necessary to have an assistant hold the speculum, thus enabling you to use both hands in separating the parts more effectually.

Treatment.—The principles involved in curing fissure are rest and drainage. Failure to obtain these accounts for the chronic cases.

The advocacy of any single procedure for the cure of all cases of fissure would be illogical. Each case must be treated according to individual indications, and the surgeon should be guided by these characteristics. In all cases, however, the bowels should be kept open by injections of olive oil or glycerin suppositories. Some make the mistake of giving their patients salts, or some cathartic that causes a fluid evacuation, believing that by so doing they are making it easier for the patient. On the contrary, there is nothing more irritating than a liquid stool, because of the excessive salts and eliminative matter which it holds in solution; on the other hand, the suppository or olive oil, by softening the outside of the mass and lubricating the passage, permits of an easy movement through the anus.

When the fissure is recent, the application of a little cotton, saturated with pure ichthyol, and allowed to remain in place for several hours, will sometimes afford the most gratifying results. Then again the application of a solution of silver nitrate, 20 grains to the ounce, will in other cases produce a rapid healing; acentanilide powder, dusted on the parts, will also accomplish the same purpose.

When the fissure has existed for some time, and local applications fail to relieve it, surgical procedure is obviously the only alternative.

Fig. 67
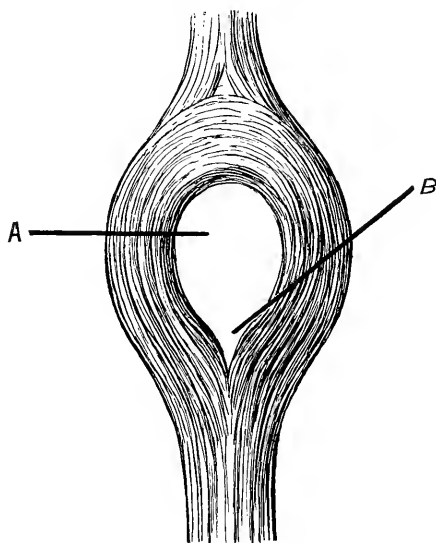
The right way (*A*), and wrong way (*B*), of cutting a sphincter.   (Lynch.)

Surgical Treatment.—Divulsion requires an anesthetic, increases the traumatism, causes extravasation, seldom gives permanent relief, and should have no place in the treatment of fissures. Incision is the only logical treatment of fissure after the primary stage. The patient having been thoroughly prepared is placed in the lithotomy position if a general anesthetic has been given; otherwise, in the Sims' posture. A Sims' speculum is now inserted when the fissure will be brought well into view. Careful examination with a probe will reveal any burrowing tracts, which should

be followed up and opened; then the edges of the fissure are carefully trimmed and an incision made through the middle of the fissure; this is carried well out into the skin, the idea being to establish free drainage. This can only be accomplished by making the skin incision a fairly deep one, so that we have an inclined plane from the inner limit of the fissure to the end of the skin incision.

To proceed, the edges of the skin are now trimmed to prevent early healing of this part of the wound; and I wish to emphasize the importance of this procedure, for it is on the observation of this rule that the success of the operation depends. If the skin incision is not kept open until the mucous membrane is healed, all our work is in vain, and a return of the original condition assured. The wound is now packed with iodoform or plain gauze, in layers, according to the personal preference of the operating surgeon. Personally, we prefer the former. This is allowed to remain in place for forty-eight hours, and at the end of that time all but the last layer is removed. The object of permitting the last layer to remain is to protect the wound until after the bowels have moved. It also saves the patient pain. After the bowels have moved, the last layer of gauze is removed and the wound re-dressed with balsam of Peru and olive oil, 10 per cent. Some times difficulty is experienced in removing the last layer of gauze, because the granulations have become entangled in the meshes of the gauze. However, the pain in such cases can be reduced to a minimum, and the difficulty of removing the gauze obviated, by first spraying out the wound with a warm saline or peroxide of hydrogen solution.

For a week the wound is dressed every day, every other day in the second week, and every third day from then on until the wound is well. The bowels should be regulated from time to time by giving laxol, or something similar, in order to secure soft movements. The patient should be instructed to sit in a tub of warm water after the bowels have moved, and, in this way (if a nurse is not available to wash it out by syringing with warm saline) the wound can be kept clean. There is always a certain amount of leakage following these operations as a result of temporary incontinence; but, except for keeping the

9

parts clean, there is really no way of helping this complication. However, it is well to reassure the patient by explaining to him that this condition will disappear when the wound is healed.

Local Treatment.—The following procedure has been found useful in the treatment of many cases of fissure. A conical speculum is well lubricated and gradually inserted into the anus. When the speculum has been inserted, the shutter, being over the fissure, is gradually opened, and in this way a full view of the ulcer is obtained. The fissure is then painted with a little cocaine, and this is followed by an application of pure ichthyol, or nitrate of silver, 5 per cent. or tincture of iodine, or the fissure may be cupped.

CHAPTER VII.

ULCERATIONS OF THE RECTUM AND ANUS.

IF we are to believe bacteriologists, the intestinal tract is an excellent incubator for bacteria. That there are innumerable varieties can hardly be questioned. Notwithstanding this, a wound of the rectum or sigmoid, under ordinary circumstances, heals very readily. The mucous membrane, especially in the lower reaches of the canal, is constantly subjected to insult by the hard fecal matter which accumulates, especially in constipated individuals; yet, in the majority of cases nothing very serious happens, except a mild catarrhal inflammation. If one wants to be convinced of this fact, he has only to remove a portion of the mucous membrane with the specimen forceps, and subsequently watch the healing of the ulcer. In every case, except where a serious infection already exists, it will heal within a week. One naturally wonders why it is that the bowel wall has such power of resistance to infection.

Ball explains this condition, so far as the anal canal is concerned, as being due to its anatomical structure. He says that in this region the muscles are closely bound together, there is very little loose cellular tissue there in which the serum can collect, and the drainage is excellent. On the other hand, he claims that corresponding conditions above the levator ani muscle are exactly opposite to those that exist below, the rectum being surrounded by loose cellular tissue, which permits of the infection spreading rapidly, and consequently the infection above the levator ani muscle is a much more serious condition. We cannot agree with Dr. Ball. In the majority of cases, there is more or less sagging in of the tissue between the two sphincter muscles, which permits of the collection of serum and fecal matter, and though the portion of the bowel above the levator ani muscle contains more loose cellular tissue, and has the same amount of blood supply as the sphincter, wounds seem to heal just as rapidly and as

kindly around portions of the rectum as they do around the anus. Take, for instance, amebic dysentery, where the amœba penetrates the mucosa and gets into the submucosa, later causing ulceration; in such conditions one hardly ever sees an abscess of the bowel wall. Again, a violent streptococcus infection of the rectum and colon will exist without abscess formation. No, the explanation which Dr. Ball gives us is not sufficient.

Varieties.—Under this heading, we will describe the following varieties of ulceration of the bowel: Tuberculous, hemorrhoidal, syphilitic, chancroidal, dysenteric, gonorrheal, uremic, varicose, strictural, and follicular.

Tuberculous Ulceration.—There are three forms of tuberculosis of the bowel: ulcerative, miliary, and hyperplastic.

Primary tuberculosis of the bowel is rare. It is estimated by different authorities to occur in from $\frac{1}{2}$ to 1 per cent. of all cases of tuberculosis of the bowel, but statistics are conflicting and unreliable since it occurs more frequently in some countries than in others.

In 1230 autopsies at the Royal Victoria Hospital, in Montreal, potentially infectious tuberculous lesions were found in 285 cases; but only two were undoubted instances of primary intestinal infection (Nicholls)[1].

From statistics it would appear that primary infection is more common in England and France than in this country or Germany. The writer has never seen a case of undoubted primary tuberculosis of the intestines.

Secondary tuberculosis, on the other hand, occurs quite frequently, but here again there is a wide divergence of opinion, the percentage varying between 15 and 65 per cent.

Park and Krumweide, of the New York Board of Health, made a study of 436 cases, with the object of establishing the relative frequency of human and bovine tuberculosis. In adults over sixteen years of age there were 269 cases of human tuberculosis, and 1 bovine. In children between five and sixteen years there were 45 cases of human and 9 cases of bovine tuberculosis. In children under five years of age, there were 66 cases of human and 22 cases of bovine tuberculosis.

[1] Montreal Medical Journal, 1912, vol., xxxi, p. 372.

From these statistics (and they correspond pretty closely with the statistics of all other recognized workers) it would appear that bovine tuberculosis is responsible for a large percentage of infections of the intestinal tract in children under five years of age. This, of course, can readily be accounted for by the fact that milk forms the bulk of the diet of children at this age.

In the majority of cases the infection occurs in the intestinal tract from the swallowing of sputum in patients suffering from pulmonary tuberculosis. This, however, is denied by some authorities, who maintain that the gastric juice, especially the hydrochloric acid, is capable of destroying the tubercle bacilli. This is undoubtedly true in the case of healthy individuals, or in the early stages of tuberculosis of the lungs; but, in the course of time, the vitality of these patients is so lowered that the gastric juice is considerably below par, and is not then capable of destroying all the tubercle bacilli contained in the sputum swallowed. Besides, it is reasonable to suppose that when large quantities of sputum are being constantly swallowed, containing myriads of bacteria, some must escape into the intestinal tract. If a lesion already exists in the bowel, it can be readily seen how even comparatively few tubercle bacilli could start up a process with the resistance of the individual considerably lowered. A hematogenous infection is comparatively rare. In the early stage, the little tubercles can be seen covering the intestines, involving principally the Peyer's plaques and the solitary follicles. The bowel is usually very pale and anemic, except in the immediate vicinity of the tubercle, where there is a halo of congestion. After a while these tubercles assume a yellowish color, and this is an evidence that caseation has already begun After a while they break down, and discharge, leaving a regular jagged ulcer, with an infiltrated indurated border, undermined, in some cases. The base has a worm-eaten, necrotic appearance and is covered by little yellowish tubercles, as extension takes place between lymphatics. The tendency is for these ulcers to encircle the bowel. When close together, they coalesce, forming a large irregular ulceration involving, in some cases, the entire circumference of the bowel.

Other bacteria take a hand in the condition, resulting some-times in a gangrenous process, and terminating the life of the patient at an early period. This process extends into the muscular and serous layer of the bowel, but rarely causes perforation. This is accounted for by the fact that the process is rather a slow one, and nature has a chance to ward off the infection. When these patients are opened up, the abdominal cavity is found filled with a fluid. The bowel presents an anemic appearance. The walls of the bowel seem to be attenuated; the peritoneum is very much thickened.   In some cases, however, when the process has existed for a long time, enormous granular masses can be seen which have the appearance of a badly infected finger in the process of granula-tion. In most of these cases the appendix and cecum are involved. Sometimes the process is limited to the lower portion of the bowel, but if the ulceration is inside the internal sphincter, the process is almost certain to extend by contiguity. This is beauti-fully demonstrated in a case that came under the observation of the author. The colon, sigmoid, and lower portion of the ileum were involved in the tuberculous process. A portion of the ileum, several inches above the infected area, was isolated, and implanted in the rectum. At the time of the operation, the implanted bowel was absolutely healthy and free (as far as the eye could discern) from any tuberculous process. This operation was per-formed with the object of alleviating the suffering of the patient, who was having from forty to fifty movements daily. The opera-tion unquestionably made her days more peaceful, as she lived for six or eight months afterward in comparative comfort. The writer had permission to make an autopsy and found that the tuberculous process had involved the bowel for several inches.

Symptoms.—Diarrhea is the most constant symptom in this as in all other cases of ulceration of the bowel. At first, this may be very slight, but as the ulceration increases, the desire to empty the bowel becomes more and more imperative, so that the patient has anywhere from ten to fifty movements daily. The earliest symptom to attract the attention is the passage of mucus and gas, with irregular colicky pains and distention. This is followed later by blood mixed with mucus.   Severe hemorrhages occur, occasionally, when the ulceration erodes a bloodvessel.   The

PLATE II

Tuberculous Ulceration of the Rectum.   (Lynch.)

stools are nearly always watery, and of a dark color, on account of the decomposed blood. Sometimes they are partly formed. There may, or may not be local tenderness, depending on the extent of the ulceration and the involvement of the peritoneum. Where stenosis occurs, diarrhea alternates with constipation. The patient has severe colicky pains, and intestinal obstruction may, and does occur, if some relief is not obtained. Of course in the majority of cases the stage of stenosis is not reached because, on account of lack of nutrition, death occurs early in the disease.

Diagnosis.—As a general rule, it is comparatively easy to make a diagnosis of tuberculous ulceration of the bowel. We should always be suspicious of diarrhea, especially in children, if a tuberculous lesion exists in some other part of the body. In adults with pulmonary tuberculosis, the advent of a diarrhea should invite a proctoscopic examination. Of course, it is possible that a patient with pulmonary tuberculosis may have a diarrhea due to other causes, such as overeating, achylia, eating tainted food, or innumerable other errors, but any of these latter toxemias readily yield to treatment. If the ulcerations are seated above the reach of the proctoscope, great difficulty is encountered in arriving at a conclusion as to the cause, but if the ulcerations involve the sigmoid or rectum then the diagnosis is simple, as these ulcers are absolutely typical. Of course, where there is a certain amount of hyperplasia, a tuberculous ulcer might be mistaken for a malignant growth. Repeated examinations, however, will clear up the diagnosis, because the tuberculous ulcer never projects into the bowel as prominently as a carcinoma. If considered necessary, a scraping of the ulcer may be made.

Tuberculous ulceration may also be confused with syphilitic ulceration; but a syphilitic ulceration has a generally well-defined punched-out appearance, with an elevated border and a fibrous base, whereas the tuberculous ulceration is irregular, sometimes undermined, and the base has an irregular and worm-eaten appearance.

Treatment.—The prophylactic treatment of tuberculous ulceration is very important. The patient should be impressed with the danger of swallowing the sputum, as it is generally through this

channel that secondary infection of the bowel takes place. The same principles apply to tuberculosis, no matter in what part of the body the focus is; that is, living in the open air, day and night, as much as possible, particularly at night, very little exercise and a highly nutritious diet. Internal medication has little influence in these cases, except to upset the stomach. In alimentary tuberculosis, we have to deal with impaired digestion, which adds to the difficulty, and this is serious and not easily overcome. Nevertheless, these patients should be put under the best hygienic surroundings, with absolute rest in the open air, and a light and nutritious diet. Pasteurized milk and eggs with some predigested food between feedings, will sometimes check the disease, with such drugs as salicylate of bismuth to check the diarrhea. If the disease is confined to the colon, and the rectum has escaped, the ileum should be implanted in the rectum in order to stop the diarrhea and put the patient under the best condition for treatment. When the lesions are located in the rectum, a local application of pure crystals of permanganate of potassium, applied through the proctoscope, will sometimes be helpful. But as this is a very painful procedure the parts should first be cocainized. In the hyperplastic form of tuberculosis, a surgical operation offers the only hope of cure. This consists in the removal of the mass and subsequent enterotomy.

Hyperplastic Tuberculosis.—A form of tuberculosis which has recently caused some discussion, and about which there is some uncertainty, is the so-called hyperplastic or productive type. This was first recognized by Durant in 1890. It is frequently mistaken for carcinoma or the productive tumors which are the result of diverticulitis; it may also be mistaken for syphilis. This, like other forms of tuberculosis, is generally secondary to some focus in other parts of the body, particularly the lungs. However, it has been found by the writer, to occur as a primary lesion in the cecum, sigmoid, and rectum. It differs from the other forms of tuberculosis in that it causes proliferation rather than destruction of the tissues. It may begin in the mucosa submucosa, or peritoneum. It usually results in stenosis of the bowel with an enormous thickening of the wall.

The great difficulty in distinguishing this form of tuberculosis

from other inflammatory conditions is due to the fact that the tubercle bacilli are very hard to find. However, there are other histological changes which may lead us to a diagnosis, such as the typical giant cells of tuberculosis with peripheral nuclei in the shape of a horseshoe.

Symptoms.—The symptoms of this form of tuberculosis are similar to those of ordinary stenosis; that is, gradually increasing constipation with the passage of mucus, first, and, later on, of pus, mucus, and blood. The patient has a desire to move the bowels frequently without accomplishing much, passes mucus, blood, and pus, and has a feeling all the time as if there were something more to come away. There is a loss of weight, a heavy feeling in the pelvis, tenesmus, and sometimes pain in the sacrum.

Treatment.—The treatment of this form of tuberculosis is wholly surgical, and consists in the entire removal of the diseased area wherever possible. Of course, as in all other forms of tuberculosis, good food, living in the open air, and every other known measure to increase the resistance of the patient should be followed.

The tuberculin treatment of tuberculosis seems to have gained a firm foot-hold, and in some cases has proved to be of marked benefit. The proper method of administering tuberculins is very important, and for that reason an outline is given below.

The Geometric Method of Administering Tuberculins.—To obtain an average proper increase of tuberculins, it is necessary that the increase be at all times a certain percentage of the previous dose. This percentage is usually 25 per cent. The first dose administered is $\frac{1}{100000}$ of a c.c. The dilution necessary to administer this small amount means that four bottles are needed, one labelled A, another, B, another C, another D. By using $\frac{1}{2}$ c.c. of tuberculin, and $49\frac{1}{2}$ c.c. of diluin, which is normal physiological saline solution, to which $\frac{1}{2}$ per cent. carbolic has been added, a 1 to 100 dilution is obtained, and is placed in bottle A. 1 c.c. of solution A to 9 c.c. of diluin placed in bottle B produces a 1 to 1000 solution. 1 c.c. of solution B to 9 c.c. of diluin placed in bottle C produces a 1 to 10,000 solution. 1 c.c. of solution C to 9 of diluin placed in bottle D produces a 1 to 100,000 solution. Of this solution D, 1 c.c. is the first dose.

1 c.c. solution D, first dose.

1.25 c.c. solution D, second dose.

1.57 c.c. solution D, third dose.

1.96 c.c. solution D, fourth dose.

2.45 c.c. is the next dose, but as this quantity is too large to inject, it is usual to make the dilution instead of 1 to 100,000, 1 to 50,000, thus administering $\frac{1}{2}$ the amount, or, in other words, 1.26 of the 1 to 50,000, increasing the dose at this point by 25 per cent., and reducing the dilution so as to at no time give a greater amount than 2 c.c. By this method, you will find that there will never be the production of a negative phase, that the patient will be producing a definite regular geometric increase in the opsonic index.

Hemorrhoidal Ulceration.—This form of ulceration is very common, and if not taken in time may result in severe secondary anemia, infection, abscess formation, and fistula. The ulcers are superficial, irregular, with sloping borders, and look as if the mucous membrane had been shaved off with a razor.

Symptoms.—Loss of blood, pain when the bowels move, a feeling of fulness and bearing down pain in the region of the prostrate, and occasionally painful micturition.

Treatment.—Palliative and radical. The *palliative treatment* consists in astringent applications such as an ointment made of ungt. tannic acid, 2 drams; ungt. belladonna, 2 drams; ungt. stramonium $\frac{1}{2}$ oz. A mixture of equal parts of a saturated argyrol solution and pure ichthyol may also be used. The *radical treatment* consists in the removal of the hemorrhoids by any one of the operations that have been described.

Syphilitic Ulceration.—Primary chancre of the rectum, while comparatively rare, is occasionally seen, and should be recognized early; otherwise serious results may follow, both to the patient and his immediate family or others. Three such cases have come under the observation of the writer within the last ten years. They are very characteristic, but differ in a great measure from the ulcerations from chancre that are usually seen in other parts of the body, particularly the penis. One case, in particular, was seen very early in the disease, and we were able to follow its involution and evolution for several months (see Fig. 68.)

It looked, for all the world, like a fan-shaped extension of the mucous membrane. It was slightly raised above the skin, and was at first bright red in appearance, fading gradually until it became a dusky red. There was no induration, such as occurs in other parts of the body. This is particularly typical of primary syphilis of the rectum. The diagnosis of this case was confirmed by recovering the spirochetæ from the inguinal glands; later on, by the Wassermann reaction, and still later, by the appearance

Fig. 68

Primary chancre of the anus.   (Lynch.)

of the secondary lesions in the skin. After the patient had been given salvarsan, the chancre faded very rapidly from the periphery toward the centre, becoming gradually paler until it assumed the natural color of the skin. Multiple gummata of the rectum developed very early in the disease. A specimen was taken from the mucous membrane, and a histological examination proved the gummatous character of the lesion. This patient was referred to us for fistula, a mistake which was evidently made

because of the great quantity of pus and mucus which he was constantly passing. An examination with the finger revealed a nodular condition, extending up to the sigmoid. It felt as though there were a lot of marbles or tumors under the mucous membrane. Proctoscopic examination showed the mucus membrane rather pale, and covered with pus and mucus streaked with blood. We were able to follow this case for two years, and observed it very carefully. Notwithstanding the fact that vigorous anti-syphilitic treatment had been instituted, it finally resulted in a very extensive stricture of the rectum.

Symptoms.—An intense desire to move the bowels with a constant passage of blood, mucus, and pus; a feeling all the time as if there were something more to come away; absence of relief following a movement; loss of appetite, weight, and strength.

Treatment.—Enemas of peroxide of hydrogen, 2 per cent., twice daily; swabbing the rectum and sigmoid with tincture of iodine, which should be applied in the following manner: The proctoscope is inserted to the rectosigmoidal juncture. Here, a portion of the mucous membrane, about one inch, is first painted with tincture of iodine. As the proctoscope is withdrawn, and as it approaches the anus, some ordinary starch powder is blown into the anus, so that any leaking of the iodine may be neutralized before it reaches the anus. A little more of the mucous membrane is painted every day, so that, after a week or two, the entire mucous membrane, from the sigmoid to the anus can be painted without causing any tenesmus; in other words, the patient acquires a tolerance for this drug. In most cases a colostomy is necessary in order to effect a cure, as constant passage of the feces, even with the most vigorous treatment will prevent a thorough healing of the parts.

Chancroidal Ulceration.—Chancroidal ulcerations, while usually confined to the anus and peri-anal skin, occasionally invade the rectum. When the rectum is involved, it is usually due to pederasty or sodomy. These ulcerations are superficial and irregular, with some undermining of the edges and a necrotic base covered with pale, grayish granulations. The mucous membrane in the neighborhood is edematous and covered with pus and mucus.

PLATE III
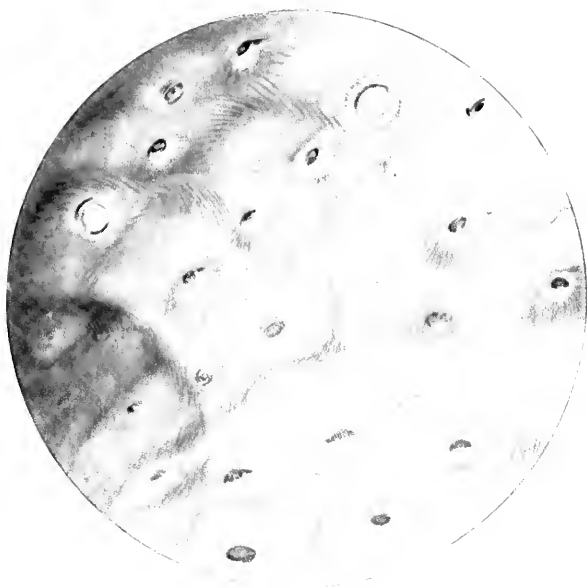
Amebic Ulceration of the Rectum and Sigmoid. (Lynch.)

Symptoms.—The first symptom is a heavy feeling in the rectum, tenesmus, and a desire to move the bowels, with discharge of mucus, sometimes mixed with blood. Diarrhea subsequently occurs, with a severe burning sensation when the bowels move.

Treatment.—The patient should be confined to bed, and the rectum frequently irrigated with normal salt solution at a temperature of 110° F. The best method is to place the patient on the left side and pass the catheter into the rectum. The inflow catheter is passed about three or four inches higher than the outlet catheter, and the salt solution is allowed to flow in and out, continuously, for fifteen or twenty minutes at a time. After the acute inflammation has subsided, the ulcers are treated through the proctoscope with applications of nitrate of silver, 5 per cent. Insufflations of iodoform and calomel will cause a rapid healing of the ulcers. The patient should be put on a liquid diet for the first three or four days; after that on a light diet until the severe symptoms have subsided.

Complications.—Sometimes the infection spreads over the mucous membrane opening in various places, causing severe inflammation, which may require the application of the actual cautery in order to eliminate the disease.

Dysenteric Ulceration.—Dysenteric ulcers are described in the chapter on amebic dysentery. These ulcers are fairly typical, but may sometimes be mistaken for tuberculous ulcers. The two are very often associated. (For a differential diagnosis and description of these ulcers, see the chapter on Amebic Dysentery.)

Ulcers due to the bacillary form of dysentery are caused by an organism known as the bacillus of Shiga. Since Shiga first described this bacillus, others of a somewhat similar type have been found by Flexner and others. Epidemics, especially among young children, have occurred very frequently in this country, and in 1902 Duval and Bassett succeeded in isolating this bacillus from the stools of children suffering from diarrhea. Since then many other investigators have confirmed their findings. The infection is supposed to be acquired by means of food or milk, as in other forms of dysentery.

Gonorrheal Ulceration.—Gonorrheal ulcerations are due to an infection by the gonococcus. These are usually found in the lower portion of the intestinal tract; that is, within the first two or three inches of the rectum. There is nothing typical about a gonorrheal ulceration; it is superficial and irregular, parts of it usually being covered with pus and streaked with blood. A positive diagnosis of gonorrheal ulceration cannot be made without demonstration of the presence of the gonococcus. Further information, treatment, etc., regarding this form of ulceration is given in the chapter on Venereal Diseases.

Uremic Ulceration.—Uremic ulcers are usually associated with chronic nephritis, and the etiology is rather obscure. Some think it is due to thrombosis; others that it is due to the elimination of waste products, as happens when the kidney is incapacitated. The author is inclined to believe that these ulcers are due to a toxemia, which results in acute inflammation, and subsequent necrosis. They are usually superficial, with irregular and undermined borders and a granular base.

Symptoms.—A diarrhea which continues as long as the kidneys fail to functionate. When the congestion is relieved and the kidneys again take up their function, the diarrhea subsides, and the ulcers heal.

Perhaps the earliest symptom is a very acute diarrhea, anywhere from five to twenty movements, with the passage of mucus; there are also tenesmus and prostration. Later on, blood is mixed with the mucus.

Treatment.—This should be directed, first, toward the kidneys; treatment must be applied through the proctoscope, together with rectal irrigations of peroxide of hydrogen 1 per cent., or argyrol 2 per cent., or ichthyol 2 per cent.

Complications.—Very extensive sloughing.

Varicose Ulceration.—This form of ulceration is usually associated with some obstruction to the return circulation, such as intussusception of the sigmoid, pelvic tumors, cirrhosis of the liver, intra-abdominal tumors, etc. These commonly result from rupture of a vein, are irregular, flat, and superficial.

There are very few symptoms associated with this form of ulceration; occasionally the patient has diarrhea, with blood and

mucus. As a general rule, however, the malady is preceded by sharp hemorrhages, which draw the attention of the patient to the condition.

Treatment.—Treatment consists in relieving the cause, and local applications to the ulcerations.

Strictural Ulceration.—Stricture of the rectum is nearly always associated with syphilitic ulceration of the mucous membrane. The mucous membrane has a granular appearance, bleeds very easily, and is covered with pus, mixed with blood and mucus. The symptoms and treatment of this condition are described under Stricture of the Rectum (Chapter XII).

Follicular Ulceration.—In this form of ulceration, the solitary lymphatic follicles are involved. Hyperplasia of the lymphatic elements occurs, which subsequently undergoes central caseation. As a result of the pressure on the overlying mucous membrane ulceration occurs. These ulcers are very numerous, and can be seen studding the entire rectum and sigmoid. They are usually about the size of the head of a pin, and the edges are sharply defined and undermined. Sometimes little, yellowish, caseous masses can be seen exuding from the ulcers. They are usually secondary to some inflammation of the rectum and sigmoid, and heal without leaving any apparent cicatrix. When looked at through the proctoscope, early in the disease, the rectum and sigmoid seem to be studded with little, yellowish projections, and with innumerable pin-point ulcers in between.

Symptoms.—This condition is usually preceded by catarrhal inflammation of the large intestine with considerable mucus. Diarrhea is not a constant symptom, and very little pain is experienced. There is usually a sense of fulness with tenesmus and gripping.

Treatment.—The treatment consists in washing out the bowels with normal salt solution, or a 2 per cent. solution of ichthyol in water. Painting the bowel with tincture of iodine is very effectual. When this is done, care should be taken to insufflate some starch as the proctoscope is withdrawn to prevent the iodine from reaching the anus. Following the application of iodine, the patient sometimes experiences a fulness and bearing down, and, if this is severe, it can be readily checked by an

injection of a solution of starch. The following solutions will also be found useful:

> Aqueous fluidextract of krameria, 25 per cent.
> Nitrate of silver, 1 to 10,000.

There are a number of ulcers of the rectum which cannot be classified on account of the multiplicity of bacteria to be found in the intestinal tract. We often see severe infections followed by ulcerations, the origin of which is unknown. Most ulcerations are similar in appearance, but, from the severity of the symptoms, it is natural to infer that the infection is due to a variety of bacterial causes. We see some infections that are mild and easily controlled; others, that are very severe and impossible to control. We might refer particularly to the hemorrhagic variety of infection, which is very persistent and is probably due to some bacterium which comes into intimate contact with the stools. The only way of distinguishing these different infections is by some such method as is now used by Hastings and others; that is, by cultivating the various bacteria and testing the blood of the individual against these bacteria. This is known as the complement fixation test. Until some such method is perfected, it will be impossible to classify the various infections of the intestinal tract.

ABSCESSES OF THE RECTUM AND ANUS.

ABSCESSES of the rectum and anus occur in about 25 per cent. of the cases in proctological practice. That they are not more frequent is to be wondered at when we consider the fact that this locality is constantly subject to injury both from without and within, and more in the female than in the male on account of the proximity of the genital organs and the traumatism incident to childbirth. Moreover, women are more constipated than men, and this is an additional source of danger. It is really remarkable, however, how readily ulcerations heal in this region, especially when we consider the myriads of bacteria present. It must be that the excellent blood-supply of these parts and the quick response of the leukocytes to any reaction or injury account for the freedom from infections, compared with other regions subject to the same amount of traumatism. In addition to the sources mentioned, we must bear in mind that injury to any tissue lowers its vitality and renders invasions by bacteria circulating in the blood more liable.

Anatomy.—To show the *raison d'être* for circumscribed infections being confined to certain areas, depending on the site of the original infection, it may be well to briefly outline the anatomical boundaries of the spaces around the rectum, adding a word or two on the lymphatic supply. The levator ani muscle separates the rectum from the anus; therefore, abscesses occurring in the neighborhood of the anus generally rupture on the outside or between the two sphincter muscles. An abscess occurring in the triangular space posterior to the anus may rupture into the ischiorectal fossa or through the skin. Infections occurring above the levator ani muscle usually occupy the superior pelvirectal or the posterior pelvirectal spaces.

The superior pelvirectal space is that space which is bounded

10

above by the peritoneal reflection; below, by the levator ani muscle and its fascia; anteriorly, by the prostate and urethra; and posteriorly, by the rectum and its lateral ligaments.

The posterior pelvirectal space is bounded by the peritoneum above, the levator ani muscle below; the roof is formed by the rectum and lateral ligaments, and the floor by the sacrum.

Fig. 69
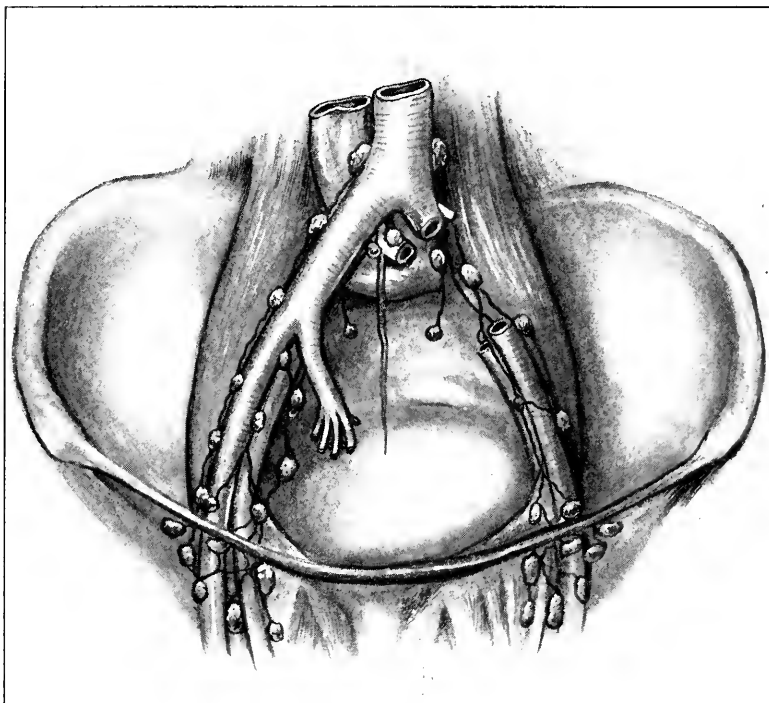
Iliac lymphatic chain.   (Piersol.)

The ischiorectal fossa is a pyramidal space; the base of the pyramid below, the apex above; bounded on the inside by the levator ani fascia, on the outside by the obturator fascia. Posterior to the anus is a triangular space with the base toward the anus, and the apex connected with the ischiorectal fossæ on each side. It is bounded above by the levator ani and its fascia; below, by the sphincter muscle, the fascia and skin.

Lymphatics.—The superficial lymphatics empty into the inguinal chain of glands; they also send some lymphatics which com-
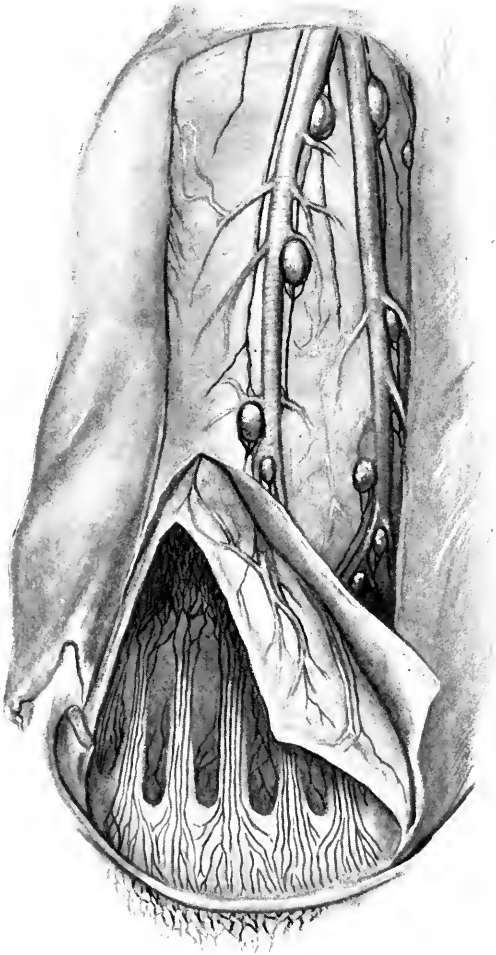
Chain of lymphatics of the rectum. (Piersol.)

municate with the chain of lymphatics at the base of the semi-lunar valves of Morgagni. The lymphatics of the rectum, anus,

and surrounding spaces empty into the anorectal nodes, thence into the nodes following the bloodvessels, then into the lower mesocolic nodes, and so on.

ABSCESSES OF THE RECTUM AND ANUS.

Abscesses.—Abscesses may be divided into two classes: those above and those below the pelvic diaphragm. Those occurring above are further divided into superficial and deep; and those occurring below are divided into superficial perianal, deep perianal, and ischiorectal.

FIG. 71

Perirectal abscess.   (Lynch.)

Superficial Perianal Abscesses.—Superficial perianal abscesses are of frequent occurrence, and are due to an abrasion of the skin, infection through a hair follicle or sebaceous glands, or thrombosis of the veins in the neighborhood of the anus. They may be single or multiple; they sometimes end in blind superficial fistulæ, or the infection may be carried into the anus, rupture and form a complete fistula, or may penetrate into the ischiorectal fossa and there cause abscess.

Symptoms.—At the onset there are no symptoms accompanying these abscesses, except the discomfort in sitting or walking and the rubbing of the clothes.

Treatment.—If seen by the surgeon when they first occur, they may be aborted by painting with tincture of iodine or by Bier's hyperemic method. When well developed, they should be opened by a crucial incision and swabbed out with a little carbolic acid and alcohol. The after-treatment is the same as would be applied to a boil or fistulous tract in any other part of the body.

Fig. 72

Same abscess as in Fig. 71, opened. (Lynch.)

Abscesses of the Glands of Bartholin are mentioned separately in order to draw attention to the fact that this form of abscess not infrequently results in a stricture of the rectum if improperly handled, and early and appropriate treatment should therefore be instituted.

Treatment.—The treatment of abscess of the glands of Bartholin also deserves separate mention, because in this region we have a perineal body and transverse perineal muscles which have a tendency to pull apart when they are cut and leave a very large hiatus. Therefore, no more tissue than is necessary for perfect drainage should be destroyed, and if a hiatus does result it should be repaired after the wound is fairly healthy.

Deep Perianal Abscesses.—By deep perianal abscesses we mean those occurring underneath the fascia. They are often a result of the previously mentioned abscesses or may occur as the result of infection through a fissure. We have frequently seen

these deep suppurations burrow from the anus beneath the super-
ficial fascia into the scrotum and form one enormous abscess
with a collection of pus in the scrotum. They may also result
from injury or thrombosis of the veins around the anus. If not
properly handled, or if allowed to run their course, they may
rupture in the usual manner through the skin, or may break into
the anus and produce a complete fistula. Again, they may
rupture on the outside, drain, and subside for a while and re-
crudesce, subsequently breaking into the anus and producing a
complete fistula.

Fig 73
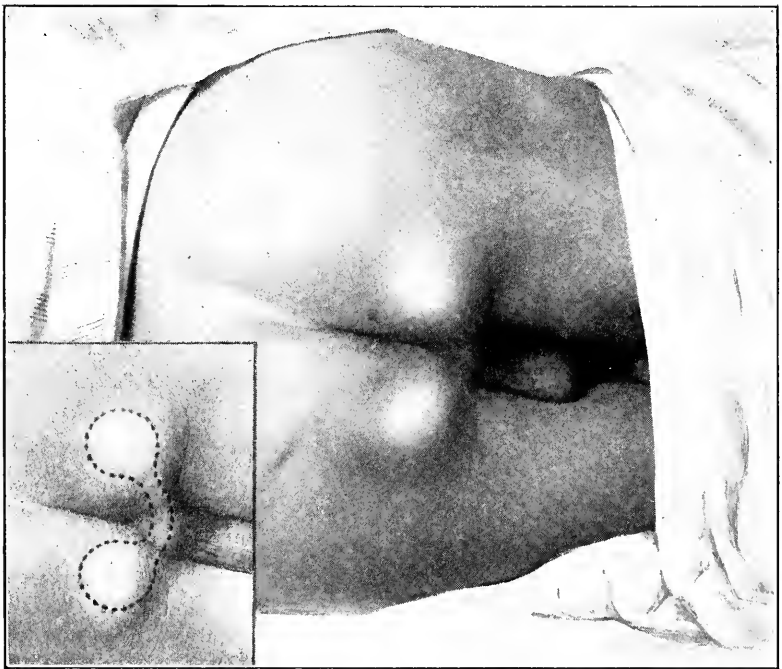
Perirectal abscesses with communication anteriorly.   (Lynch.)

Symptoms.—The first symptom may be slight chill with some
fever, or merely a soreness around the anus. Pain is usually
the most prominent symptom, and varies a great deal in char-
acter. It may be manifest only on walking, coughing, or sitting.
Sometimes it occurs only at night, during urination or defecation,
or following a bowel movement. In a great many cases, it is

worse after a movement. The pain may be acute, aching, or
burning. It may last a short time, and be aggravated by a move-
ment. The next symptom to be observed is usually a swelling,
and of course this is present in all cases. Tenderness accompanies
the swelling. Blood is seen in a small percentage of cases, and
this only when there is some ulceration of the bowel or it is
associated with bleeding piles. Sometimes the abscess is deep,
and the infection, for some reason or other, so mild that there is
very little reaction. Under these circumstances very few symp-
toms, except the presence of the swelling, are manifest. There is
very little discomfort, and these abscesses are sometimes mis-
taken for cysts. It is only after they are opened that the
presence of pus is discovered.

Treatment.—The patient having been properly prepared by
painting the skin with tincture of iodine or washing off with
alcohol, an incision is made through the skin and fascia until
the abscess cavity is reached. This can be done under local
anesthesia, ethyl chloride applied locally, or under general anes-
thesia, our preference being for gas and oxygen or ethyl chloride
by inhalation. The incision should be made long enough to reach
the most dependent point of the abscess. A crucial incision
is sometimes necessary in order to keep the skin from closing
over the opening. The cavity is subsequently packed lightly
with iodoform gauze, or drainage is established by means of a
rubber tube or cigarette drain. At the end of twenty-four hours
the gauze and drainage are removed and the cavity washed out
with Wright's solution, the formula of which is as follows:

> 4 per cent. sodium chloride
> 1 per cent. sodium citrate

or any of the following solutions may be used for irrigation:
Normal saline, saturated solution of cream of tartar, 20 per cent.
solution of boric acid, or a 5 per cent. solution of peroxide of
hydrogen in saline. The abscess is dressed every two or three
days until entirely healed. When these abscesses burrow under
the sphincter, but do not rupture into the anus, some doubt may
exist in the mind of the surgeon as to whether he should cut the
muscle, even though there be no internal opening. It is seldom

necessary to do this except where the abscess is so close to the anus that some difficulty is experienced in the after-treatment of the case on account of the depth of the cavity. As a general rule, it may be said that all that is needful is an external incision of from one-half inch to two inches in length, and to carry the cut internally higher and farther away from the anus than the apex of the sinus. This is kept open until it has healed from above. A crucial incision is sometimes wise in order to facilitate subsequent dressing by allowing the skin to fall away.

Infections Occurring in the Triangular Space Posterior to the Anus.—Under deep perianal abscesses we may describe *infections* occurring in the triangular space posterior to the anus. An abscess in this region nearly always follows an ulceration in the posterior commissure between the two sphincters. In the majority of cases there is a depression between the two sphincters, more marked in some individuals than in others, which acts as a receptacle for debris and fecal matter. This depression is closed at both ends by a muscle which is spasmodically contracted when there is any irritation in this region, and this is another reason why infection is more likely to follow an ulceration. When an ulceration occurs in this region, either as the result of traumatism, the lodgment of a foreign body such as a fish bone, or from cryptitis, pus and fecal matter collect, and imperfect drainage causes erosion into the triangular space; whence infection through the lymphatics results in abscess formation, which may terminate in one of three ways. Either it drains imperfectly into the anus; or it continues to burrow until the skin is reached and a complete fistula formed; or, again, it may rupture at the apex into either or both of the ischiorectal fossæ, and there produce an abscess, which, if allowed to run its course without suitable treatment, may terminate in a horseshoe fistula.

This triangular abscess is of frequent occurrence and very often runs a chronic course before it is seen by the surgeon, and for the following reason: it is always preceded by an ulceration or fissure in the posterior commissure, and the patient has become so used to the pain that the addition of a little more inconvenience caused by the abscess does not impress him with the fact that more serious trouble has resulted. Most of these abscesses rupture

into the anus, and the patient is so relieved by the discharge that he does not seek advice perhaps for years or until an external opening occurs. Though the internal opening may be very small, the roof of such abscesses may be so frail that it gives way on digital examination of the anus, and the finger passes into an enormous pus cavity.

Fig. 74

Abscess in the triangular space, due to infection from an ulceration in the posterior commissure. (Lynch.)

Diagnosis.—The diagnosis is usually made from the history of the case and digital exploration. There may or may not be evidence of inflammation or swelling at the site of the abscess. The history will run somewhat as follows: There is pain during and following a movement of the bowels; this continues for some time, then becomes severe and the patient notices local swelling. He will be exceedingly uncomfortable for four or five days and finally

have a discharge of pus and feel relieved. Pain may persist during the movement of the bowels, but is not so severe. A watery or purulent discharge causes excoriation of the skin. The discharge may subside somewhat and the itching and excoriation of the skin disappear. The patient may be comfortable for a time until the anal opening closes and the drainage becomes imperfect or ceases. With the accumulation of pus there is a lighting up of the abscess, which may discharge into the anus or burrow out through the skin.

Treatment.—If seen in the acute stage, either during or after the formation of the abscess, a free incision followed by drainage is the only safe method of treatment. The surgeon having decided on the form of anesthesia, either general or local, and the patient having been properly prepared, including a thorough irrigation of the rectum with salt solution, an incision is made posteriorly extending from a point about midway between the two sphincter muscles to the coccyx, including the external sphincter. Two lateral incisions extending just outside this muscle about an inch on either side of the abscess complete the operation. The cavity is now packed with iodoform gauze and over this we place some loose gauze. The T-binder is then applied, or else the buttocks are strapped together by means of adhesive plaster. The patient is given a hypodermic of morphine from $\frac{1}{8}$ to $\frac{1}{4}$ grain, and returned to bed. At the end of forty-eight hours the dressing is removed and the patient given an injection of from 4 to 8 ounces of olive oil; this is retained for some time. The patient is then given a cathartic, and when the bowels are thoroughly emptied the intestine is irrigated with normal salt solution. Finally, the wound is lightly packed with gauze saturated in balsam of Peru and castor oil, 10 per cent. After this the wound is packed every other day for a week; after the granulations are established, about twice a week. Care should be taken that the wound heals from the bottom and that the skin does not heal over before the granulation tissue is on a level with the skin.

Ischiorectal abscesses result from traumatism, skin infection, fissure in the posterior commissure, abscess in the triangular space as a result of infection in one of the other spaces around the rectum, perforation of the anus by foreign bodies, ulcerated hemorrhoids

or cryptitis. It is not reasonable that abscesses in this region originate from malformations of the anus, such as diverticula, but it must be admitted that this is occasionally a cause of ischiorectal abscesses. So seldom does this occur, however, that it is only mentioned in order to draw the attention of the surgeon to the possibility of such an origin. It is particularly important on account of the fact that unless these diverticula are removed at the time of operation the original cause of the ischiorectal abscess remains, and so a permanent cure cannot result.

The offending organism is usually the colon bacillus. On account of the looseness of the cellular tissue and the capacity of the fossa, large quantities of pus may collect before the abscess manifests itself. If not opened by the knife, the pus in these cases will follow the line of least resistance and point toward the skin. The pus may burrow between the external sphincter and the levator ani muscle, and finally open between the two sphincters in the posterior commissure. Occasionally the pus ruptures through the apex of the fossa into the ampulla of the rectum. The fat in this space is divided into a number of compartments by trabeculæ, and instead of one large cavity we may find numerous small abscesses which, if not individually opened, may delay or prevent healing. When these suppurations are the result of streptococcus infection they may end fatally if proper measures are not instituted in time. The writer saw one case that ended fatally after having extended over many months. In this case we believe that if the abscess had been opened in the beginning by one large incision, and drainage properly established, the patient would probably have made a good recovery. She was almost moribund when seen, and, on account of the general sepsis, very little could be done to relieve her condition. If such abscesses are opened early by a vertical incision and thorough drainage established, excellent results are usually obtained.

Symptoms.—The constitutional symptoms following infection of the ischiorectal fossa are out of proportion to the gravity of the case. The earlier symptoms are perhaps a slight chilly sensation which becomes more marked as the infection develops, when the temperature may reach 104° or 105° F., with headache, chill, etc. There will be severe pain on the affected side,

increased during defecation.   After a while the patient becomes incapacitated and the slightest movement brings on the most intense suffering, which continues until the abscess ruptures or is opened by the knife.   After drainage is established all the symptoms subside and, except for some local tenderness, very little inconvenience is experienced.

Diagnosis.—An abscess in the ischiorectal fossa cannot be confounded with anything else except a deep-seated perirectal abscess; but if the rectum is explored digitally the pus can be felt pointing in that direction toward the apex of the fossa.   The picture presented by an abscess in this region is very character-istic.   The buttocks are red, swollen, and shiny, the greatest amount of inflammation being close to the anus and below the intertrochanteric line; fluctuation can be felt over the centre of the abscess.   Retention of urine and symptoms of irritation of the neck of the bladder may be an accompaniment of infection in this region.

Treatment.—The moment the diagnosis has been made the abscess should be opened by a longitudinal incision.   All the trabeculæ which cause pocketing of the pus should be broken down and the cavity packed with iodoform gauze.   A drainage tube should be inserted and the gauze packed loosely around it. After the first twenty-four hours the gauze is removed and the drainage tube allowed to remain in the space for a few days. It is not good policy to repack these abscess cavities, except very lightly, just enough to keep the walls apart so that pocketing does not occur.   Tightly packing an abscess cavity for many days or weeks is almost certain to be followed by a fistula.   It would be almost better if nothing at all were done, after the first twenty-four hours, except to wash the cavity out with normal salt solution.   It should not be inferred, however, that an abscess cavity like this needs no care; watchful supervision is necessary until it has entirely healed.   It should always be borne in mind that unless there is some evidence of pocketing it is poor policy to break down tissue that is fairly healthy. We have occasionally seen an ischiorectal abscess open and all the tissue in the neighborhood broken down and traumatized without any particular reason.   When the tissues around the

abscess are damaged the infection is apt to spread, if not directly, by way of the lymphatics. It should be also remembered that nature makes an effort to ward off all infections by a connective tissue barrier in all cases, and the sanctity of this barrier should be observed.

Complications.—General sepsis may follow or accompany an ischiorectal abscess, but it is a rather rare occurrence. The most frequent sequelæ are external rupture, internal rupture, or involvement of the opposite fossa with consequent horseshoe fistula.

Failure to cure an ischiorectal abscess is often due to imperfect drainage. This imperfect drainage may be the result of too small a primary incision, or failure on the part of the surgeon to appreciate the fact that pus is pocketed in many ischiorectal abscesses. Failure to open up these pockets must result in reinfection, fever, and sepsis. Again, many fail to realize that an ischiorectal abscess is the end-result of a fissure. First we have fissure, then infection of the triangular space, and then ischiorectal abscess.

Failure more often results from overtreatment than from lack of treatment.

After-treatment.—After-treatment requires good judgment with watchful supervision. The drain should be removed at the end of forty-eight hours and should not be reinserted unless some unusual condition arises. After this the cavity is washed daily with normal salt solution, and the skin opening prevented from closing. A little wick of gauze may be passed into the cavity. If at any time there is pocketing, these pockets should be broken and the cavity allowed to fall together and fill in by granulation.

Superior Pelvirectal Abscess.—Probably the most common cause of superior pelvirectal abscess is ulceration of the anterior wall of the rectum above the internal sphincter. It frequently arises from prostatic or seminal-vesical infection. It may result from suppuration originating in sacro-iliac or spinal disease (usually tuberculous), from tubal or other periuterine infections, from the traumatisms, and in one case that came under our observation that followed a Whitehead operation. The proper

recognition of these abscesses is a matter of great moment to the patient, because if they are allowed to continue their course considerable destruction of tissue may result and the abscess rupture into the peritoneal cavity with a fatal termination; or it may open into the inguinal region anteriorly, resulting in a chronic fistula, or gravitate into the posterior pelvirectal space. If opened early and in a proper manner, it heals readily, causing the patient no more inconvenience than an abscess in any other region.

Symptoms.—The patient may or may not give a history of ulceration of the bowels, since it may be so slight as to be over-looked. A previous history of gonorrheal infection followed by suppression of urine, or tenesmus and frequent urination with a sense of weight in the perineal region, and later some relief from the urinary symptoms, should be looked upon with suspicion, because the abscess in all probability has ruptured into the superior pelvirectal space. As a general rule, the first symptom noticed by the patient is a feeling of weight in the rectum with a bearing down feeling and a desire to defecate; this is followed by fever, chills, and headache. As the pus accumulates, the pain becomes more severe until the abscess ruptures or is incised.

Diagnosis.—The diagnosis of an abscess in this region is best made by an examination of the rectum. The index finger is introduced pointing posteriorly, and gradually swept around till a soft, boggy mass or tumefaction can be felt anteriorly. This method of examination is sometimes difficult unless the patient is under the influence of an anesthetic.

Treatment.—The proper method of opening these abscesses is important if the patient is to get the best results. It can readily be seen that if the infection results from a prostatic abscess, serious consequences might follow if it is improperly handled. We have in mind one case, under observation for several years, after an abscess in this region had been improperly opened. The result was a complete urethrorectal fistula. This resulted from the abscess being opened through the rectum instead of through the perineum.

Preparation of the Patient.—If there is any danger of the abscess rupturing by delaying over twenty-four hours, it should be

opened immediately, abandoning all preparation except painting the perineum with tincture of iodine. If there is no immediate danger, and some time can be taken for the preparation, it is much better. The patient should be given a cathartic the night before and the bowel thoroughly irrigated two or three times the next morning with normal salt solution.

When the patient is under the anesthetic, he is placed in the lithotomy position. An incision is made anterior to the rectum, between it and the urethra; then the dissection is continued very carefully until the levator ani muscle is reached and a transverse incision made through this muscle. By this method the tendency of the muscle to pull apart keeps the wound open, and thorough drainage can be established. After the cavity has been explored with the finger, a drainage tube is inserted and gauze lightly packed around it. The abscess is irrigated with warm saline and gauze is placed around the catheter and retained by strips of adhesive plaster. At the end of forty-eight hours the dressings are removed and the cavity washed out with Wright's solution, normal saline, or boric acid. This is continued until the abscess has thoroughly healed. If a fistula results, it can be treated by injections of Beck's paste.

Sequelæ.—Urethrorectal fistula is almost certain to result if the abscess perforates the rectum. The symptoms, management and treatment of urethrorectal fistula are described in another chapter.

A fistula running from the rectum and opening into the inguinal region very often results from superior pelvirectal abscess, if allowed to run its course without appropriate treatment. The symptoms in such a case are pain in the iliac region, with a tumor in the same locality felt on palpation. If the abscess points toward the skin, and there is a good deal of fluctuation in the iliac region, it must be opened. It would be better, in such cases, to pass a drainage tube through the upper opening and bring it out through the perineum with through-and-through drainage. The after-treatment of the resulting fistula consists in passing through the sinus a catheter to which is attached a piece of gauze; the gauze is pulled through after the catheter is delivered, thus curetting the fistula. The tract is then injected with Beck's

paste, which is repeated until it closes. If this method fails, the curetting should be resorted to again, and nitrate of silver, 5 grains to the ounce, injected into the tract. All these fistulæ heal eventually.

Abscess in the Posterior Pelvirectal Space.—Infection of this space very often results from superior pelvirectal abscess. At

Fig. 75
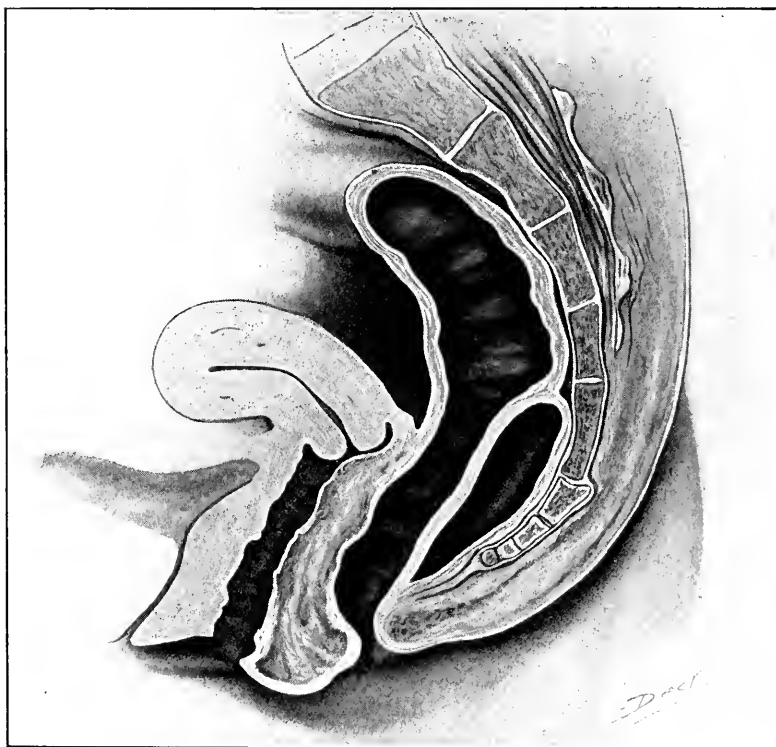
Postrectal abscess. (Lynch.)

the upper limit of this space, or on each side of the bowel just where the peritoneum is reflected, are two spaces filled with fat and loose cellular tissue, and through these the pus finds its way into the posterior pelvirectal space. This, however, is not the only source of infection, as an ulceration of the bowel, a fistula, a necrosis of the sacrum or coccyx, or an abscess in the triangular space may cause infection here and result in abscess.

As can be seen from the description of the lymphatic supply, nearly all the lymphatics around the rectum empty into the posterior pelvirectal space, and consequently an ulceration of the

Fig. 76
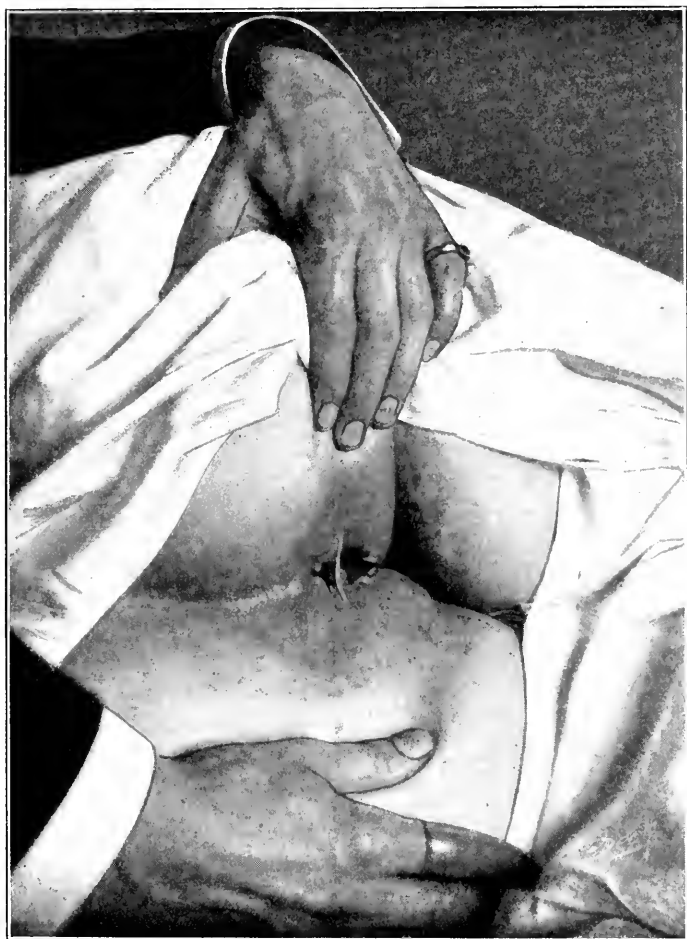
Posterior abscess in a child.   (Lynch.)

rectum or an infection in any of the spaces mentioned may eventuate in a posterior pelvirectal abscess. It may result from the breaking down of the lymphatic glands, and it is very difficult in some cases to trace the source of infection.

11

Symptoms.—Large quantities of pus may accumulate before any marked symptoms are evident. As a general rule there is some fever, 100° to 101° F., with chilly sensations, pain in the back, a bearing down feeling in the rectum, pains down the sciatic nerve, and pain in the anus.

Diagnosis.—The diagnosis can usually be made by a digital examination, when a soft, boggy, fluctuating mass can be palpated in the rectum. If the abscess points toward the peritoneum the diagnosis is simplified. If, as frequently happens, the abscess burrows around the superior pelvirectal space, infecting this and pushing the peritoneum before it, finally opening in the inguinal region just as a superior pelvirectal abscess, the diagnosis is somewhat difficult.

Treatment.—Abscesses in this region should be drained by an incision running from a point about one-half inch to one inch back of the posterior commissure, extending along the outside of the coccyx to the sacrococcygeal joint, and if necessary along the side of the sacrum until the most dependent point is reached. After the skin and fascia have been incised, the levator ani should also be cut, and it is advisable in most cases to cut the levator ani at right angles to the skin cut, so that the fibers of the levator ani muscle will not close the opening into the pus cavity and cause a subsequent accumulation of pus. This form of abscess should be treated on the same lines as those laid down for the treatment of ischiorectal abscesses. A drainage tube should be allowed to remain in place for about forty-eight hours, and when removed a smaller tube may take its place until the abscess is thoroughly drained. The cavity should be subsequently washed out with normal salt solution and watched carefully to see that pocketing does not occur. This condition can best be discovered by passing the finger into the wound occasionally. Such an abscess cavity should heal within a month.

FISTULA.

A FISTULA is a chronic suppurating canal resulting from an imperfectly drained abscess, of which the one or more openings may be, in the course of time, covered by epithelium. Some authors claim that a fistula results from a penetrating wound, which is conceivable if it becomes infected; but, if it does not become infected, primary union and not a fistula is the ordinary result.

It may be put down as an axiom that an abscess always precedes a fistula. For the sake of convenience, fistulæ are usually divided into two classes, complete and incomplete. Incomplete fistulæ are further subdivided into external and internal incomplete. An incomplete fistula is usually the result of an abscess which opens early, before extensive burrowing has taken place. When an abscess is extensive enough to involve both mucous membrane and skin, it will result in a complete fistula, even when there is no apparent opening at the surface. When a fistula has existed for any length of time it usually becomes complete.

Blind Internal Fistula.—This may result from any ulceration in the anal canal. Probably in the majority of cases a cryptitis is responsible. A blind internal fistula may be superficial or deep, depending on its location and origin. If situated posteriorly, it may be either superficial or deep; but if situated anteriorly, it is more apt to be superficial. The deep, blind, internal fistula is almost invariably the result of an abscess in the triangular space back of the anus. An abscess which is the result of a cryptitis is more likely to terminate in a superficial fistula.

Blind External Fistula.—This variety may be superficial or deep, depending on the location and size of the abscess cavity. In the majority of cases it results from a superficial or marginal

Fig. 77
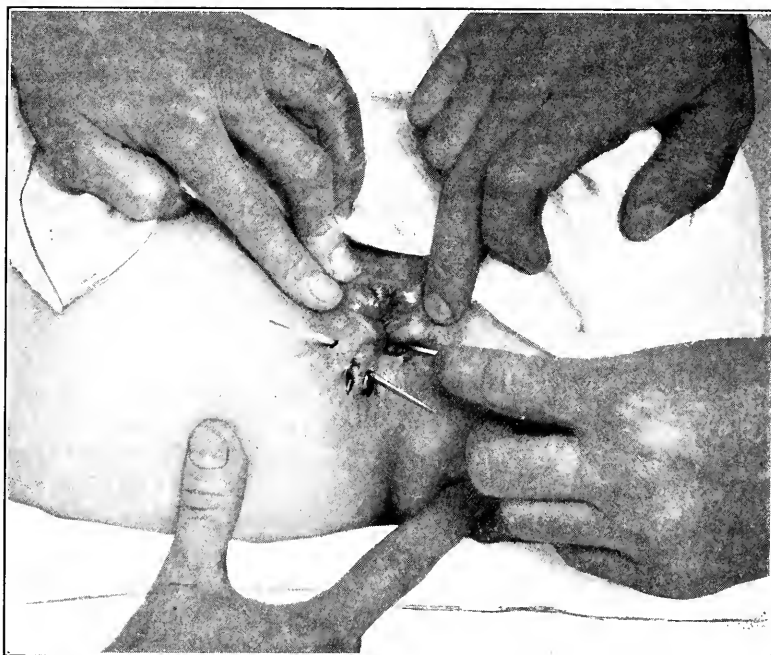
Fistula with multiple external and internal openings.   (Lynch.)

Fig. 78
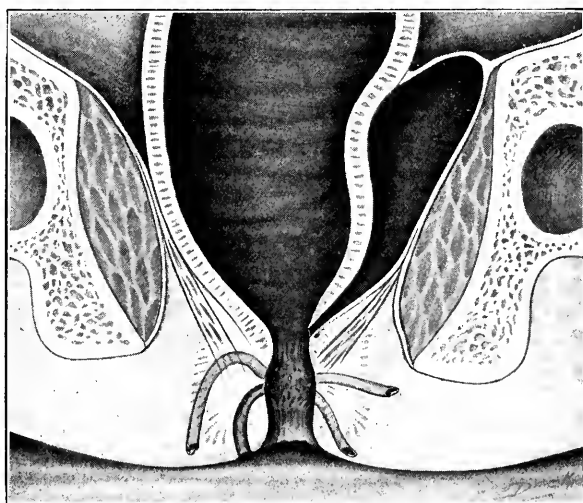
Fistula with multiple external and internal openings.   (Lynch.)

abscess. It may, however, result from a deep perianal abscess
or even an ischiorectal abscess. A large percentage of cases of
this class of fistula results from the improper treatment of an
abscess. By the word treatment, we mean to include both the
immediate surgical and the after-treatment. Imperfect handling
of the abscess at either stage is sure to end in a fistula. Too

Fig. 79
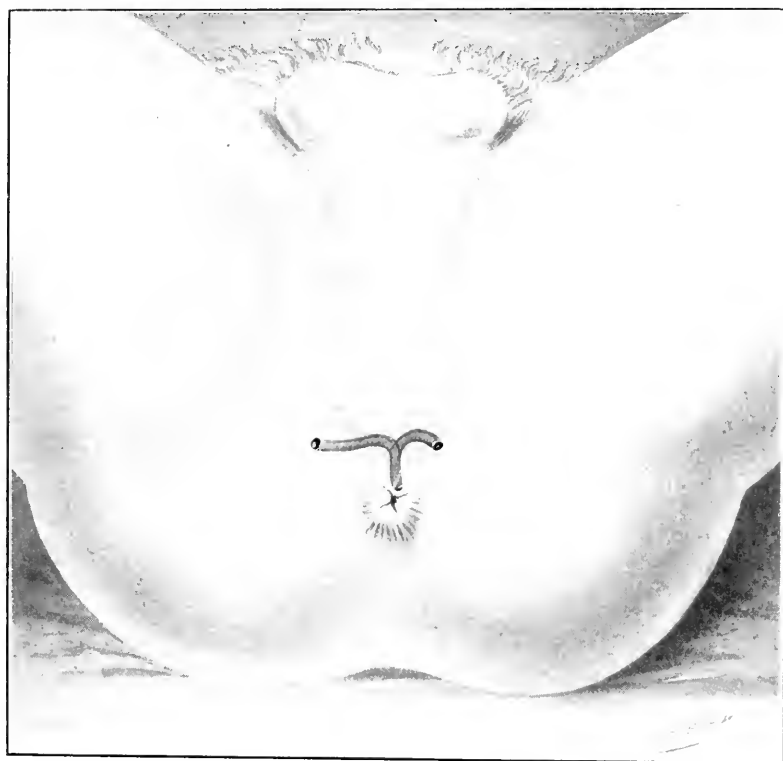
Anterior fistula, multiple openings. (Lynch.)

small an incision is responsible for a great many fistulæ of this
type. Allowing the drainage tube to remain in too long, and
overzeal in the after-treatment by keeping the fistulous tract
constantly packed, are further reasons why fistulæ so often follow.

Complete Fistula.—This may result from any of the factors
that have been mentioned in connection with incomplete fistula.

Perhaps the three most frequent causes of this type of fistula are ischiorectal abscess, abscess of the triangular space, and deep perianal abscess. Why a fistula results from an abscess is a question that has been debated for many years. As stated above, a fistula is the result of an imperfectly drained abscess. As the result of imperfect drainage we have a sinus, and sooner

Fig. 80
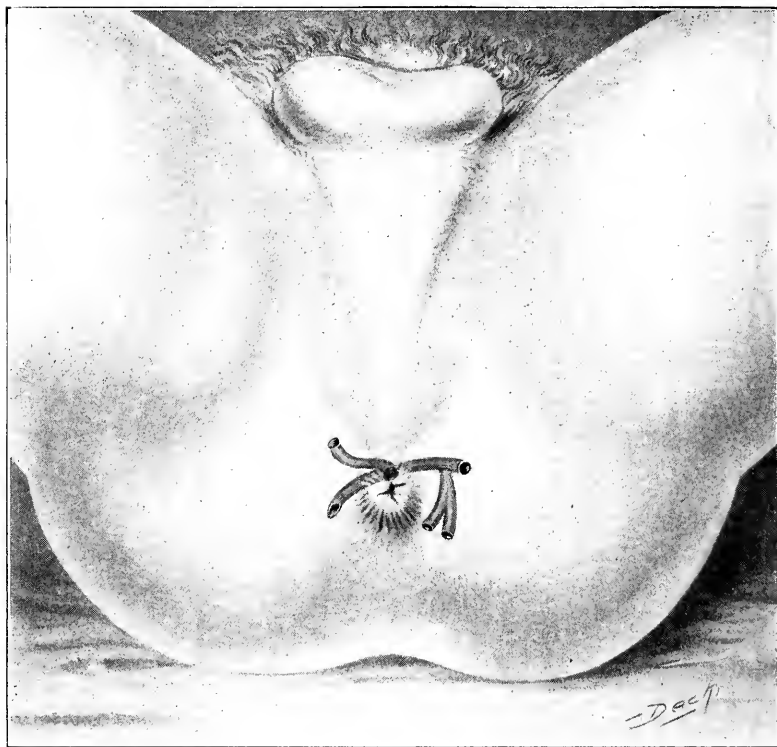
Anterior fistula with multiple external openings. (Lynch.)

or later the sinus openings are covered with epidermis. We think these factors offer sufficient explanation for the chronic course of a fistula. The internal opening of the fistula is generally situated in the posterior commissure between the two muscles. Sometimes anteriorly, just inside the external sphincter, a second opening may exist, but it is generally superficial and the result of pus burrowing underneath the mucous membrane and

subsequently rupturing into the rectum. This burrowing may occur and be very extensive without an opening high up in the rectum. In such a case the fistula generally ends in a club-shaped extremity, which is quite apparent and easily detected during a digital examination.

Fig. 81
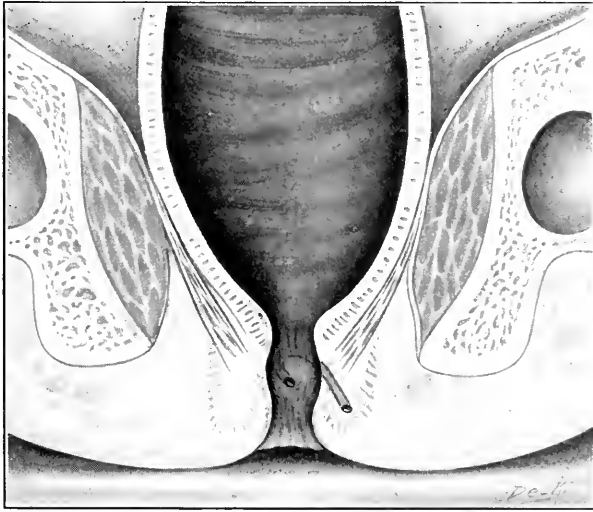
Fish-hook fistula. (Lynch.)

Salmon's law is very helpful. A line drawn from one tuberosity to the other bisects the anus. Salmon states that if the external opening is in front of the bisecting line, and within a radius of about one and one-half inches from the anal margin, the intestinal opening will be radially in from the external opening; but that, if the external opening is without that radius of one and one-half inches, or posterior to the bisecting line, then the internal opening will usually be in the posterior commissure.

Symptoms.—Some people experience very little discomfort even though extensive burrowing may have occurred. On the other hand, a submucous fistula, in some individuals, causes the most distressing symptoms. In all cases there is some discomfort around the anus on sitting or walking, and sometimes the slightest exertion will bring on very severe pain. Walking upstairs seems to precipitate pain in some cases. Of course, the symptoms are

regulated by the amount of involvement, and are dependent to a
great extent on the drainage. If a fistula is draining thoroughly,
it will not cause the same amount of distress that it does
when the drainage is imperfect. Then, again, during the "erup-
tive stage" the pain and other symptoms are the most severe.
A burning sensation during and following a movement of the
bowels is experienced by most patients, with or without the
discharge of blood and pus. Pain in the leg and over the sacrum

Fig. 82
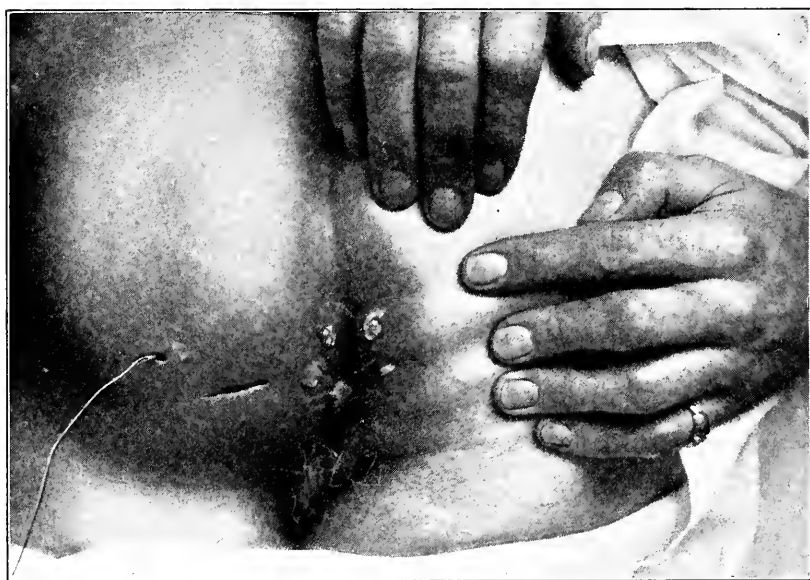
This is a photograph of a watering-pot fistula. Note the brawny swelling above,
where the probe is inserted into the distal opening. (Lynch.)

is a prominent symptom. Painful or difficult urination occasion-
ally occurs, while soiling of the linen from the discharge may be
the only symptom in other cases. Pruritus and perianal burning
and erosion of the skin occur in a certain percentage of cases,
due to the irritating discharge.

Diagnosis.—The diagnosis is made from the history, followed
by inspection, palpation, and, in the majority of cases, by finding
the external or internal opening or both. The external opening

may be a mere slit hidden in a fold of skin; a pyramidal tubercle, or a ragged opening of varying size. The internal opening can generally be detected as a little depression in the mucosa, or as a teat-like projection, or, rarely, may be surprisingly large. Of course, in the majority of cases, the canal can be followed and easily outlined by the palpating finger. Innumerable methods have been devised for following the ramifications of a fistulous tract, but few of them are absolutely reliable. In the simple fistula, the flexible probe will meet all requirements; but it

Fig. 83
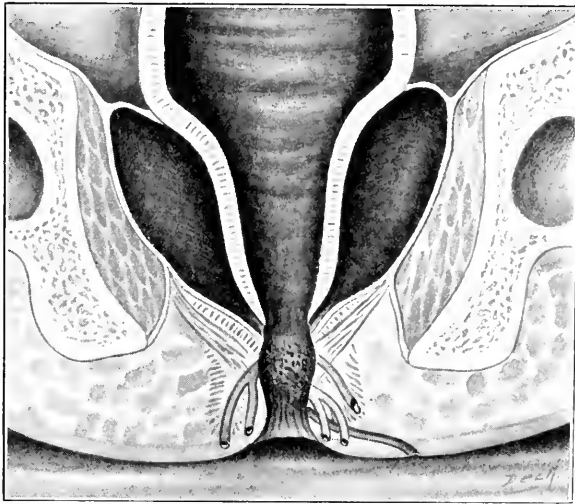
A drawing made on the same case after operation. Showing where the tracts in Fig. 82 opened into the rectum. (Lynch.)

has the disadvantage of causing considerable pain. Another disadvantage, especially in the hands of inexperienced men, is the difficulty (even in the hands of the experienced) in guiding a probe from one opening to another. If the probe is not of the required flexibility it is apt to go astray or form a false passage. To relate all the suggestions that have been made for marking out and following a fistulous tract would be to copy the whole literature of fistula. A few that have merit, and yet do not come

up to the requirements, are methylene blue, permanganate of potassium, various other coloring fluids, bismuth paste, and so on.

Fig. 84
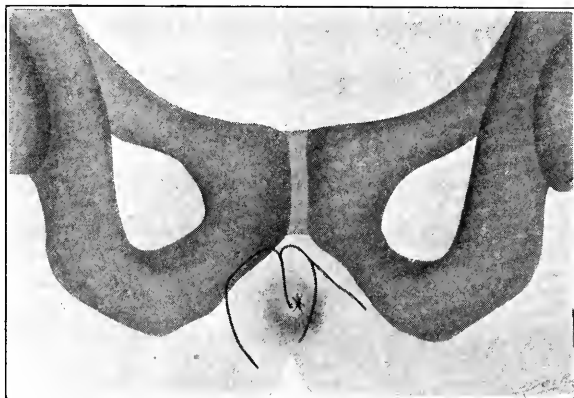
Fistula. A drawing from an *x*-ray photograph. *x*-ray picture taken by Dr. MacKee for the author before operation. (Lynch.)

Fig. 85
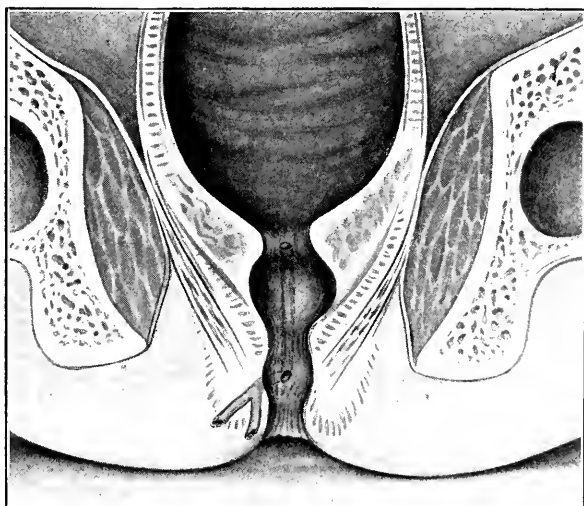
Y-shaped fistula with stricture of the rectum. (Lynch.)

A tracer, used by the writer for the past eight years, is a saturated solution of methylene blue in peroxide of hydrogen. We

Fig. 86
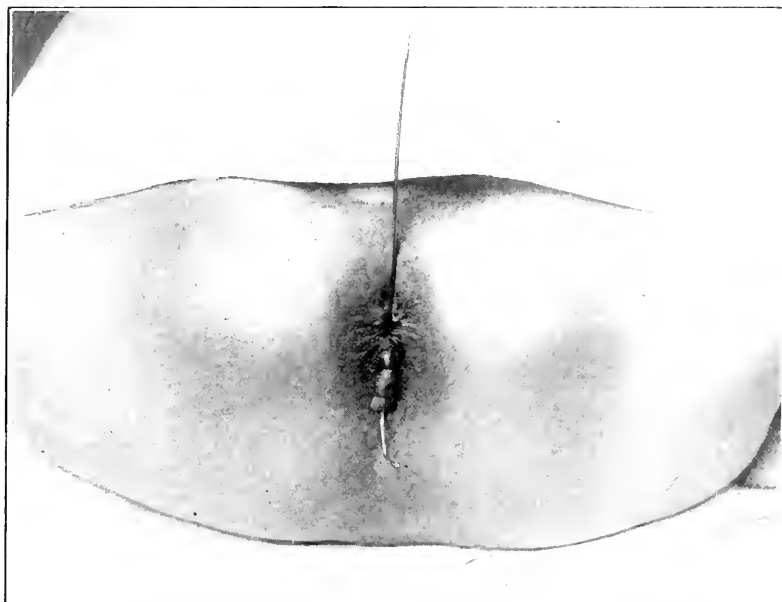
Typical fistula resulting from a cryptitis.   (Lynch.)

Fig. 87
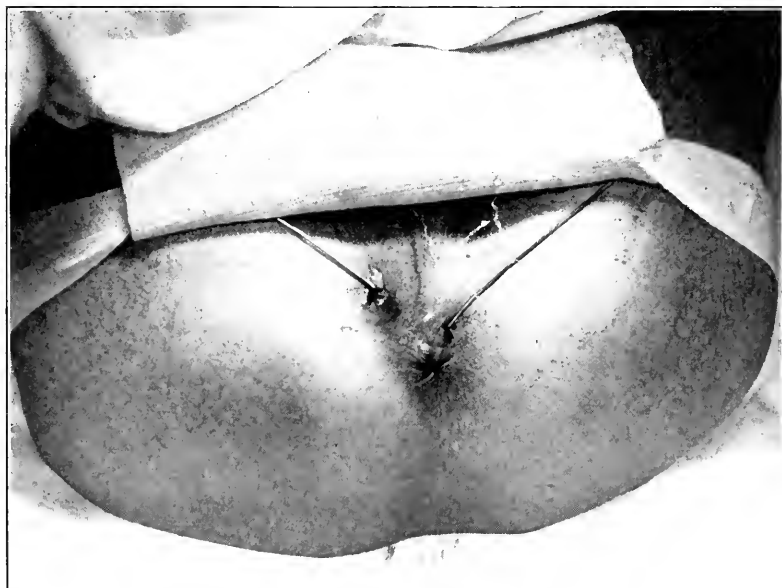
Straight external fistula.   (Lynch.)

have frequently demonstrated the value of this method as a means of diagnosis, and of its almost unvarying reliability in those very complicated fistulous tracts where the communicating sinus between two fistulæ was so narrow as to make it impossible for any probe, no matter how fine, to pass; or again, when the angle between the transverse and longitudinal fistulous tracts was very acute. This, to our mind, is the simplest and most reliable method so far devised of following the ramifications of the tract. The peroxide of hydrogen will carry the methylene blue into the finest branches of the tract; the methylene blue stains the tract, and when the surgeon comes to operate, it is a very simple thing to follow it. This method will be found specially valuable by the man who operates only occasionally on such cases, and is likely to obviate many failures that undoubtedly result from overlooking some of the branches, or from inability to find the internal opening.

The technique is as follows: A solution of 30 per cent. methylene blue and 70 per cent. peroxide of hydrogen is injected into the fistulous tract by means of a specially devised syringe, or if that is not at hand, an ordinary hypodermic syringe is used, the needle having been previously broken off close to the cap. This method is also useful in locating the internal opening, because no matter how small such an opening may be the peroxide and methylene blue will eventually appear in little bubbles, revealing almost instantly whether the fistula is complete or not.

Treatment.—There is no condition in the whole range of surgery apparently so simple; and yet, judging by results, none where the percentage of failures (in the hands of the average surgeon or general practitioner) is so great. Even the most skilful meet with accidents and fail to cure, either because they have failed to discover the internal opening of the fistulous tract or have overlooked some one of the numerous ramifications. Is it to be wondered at, then, that the general public hold the opinion that this condition is incurable? This impression is furthered, no doubt, by the fact that fistulæ, in the tuberculous, are so difficult to cure. Another reason, possibly, is that tuberculous fistulæ are opened by the knife instead of by the cautery, resulting in the opening up of the lymphatics and bloodvessels, and general disseminated tuberculosis (Lynch, *Medical Record,* June 3, 1911).

The treatment of fistula is almost as old as mankind, and there are very few methods that we rely on that are more than refinements of ancient precedures. The various methods, some more radical than others, all eventually accomplish much the same result, and are as follows:

Excision; incision, by the cautery or the knife; the application of a mucous flap after excision; or the Whitehead operation; elastic ligature; bismuth paste, after Beck's method; local applications of carbolic acid, nitric acid, and nitrate of silver.

Anterior straight fistula. (Lynch.)

Excision.—This method, we believe, is safe only in those cases where the fistulous tract is straight and uncomplicated. The technique is as follows:

The patient, previously prepared, is placed in the lithotomy position. Solution of peroxide of hydrogen and methylene blue is injected in order to stain the tract and to find the internal opening. A probe is now passed from the external to the internal

opening, bent, and brought out of the anus so that the two ends meet. An elliptical incision is made around, about one-eighth of an inch from the external opening of the fistula; then, by means of thumb-forceps and scissors, the fistulous tract is dissected out on the probe until the internal opening is reached. After the fistula has been removed the raw surfaces can be brought together by means of interrupted sutures, or the incision can be packed and allowed to heal by granulation.

The operation can be performed under local or general anesthesia, depending upon the preference of the patient and the judgment of the operator as to the availability of one or the other method. If general anesthesia is decided on, there are several anesthetics to draw upon. If the patient is not an alcoholic, the operation can be performed, without difficulty, under nitrous oxide gas and oxygen or ethyl chloride. If the patient is an alcoholic, it may be necessary to administer morphine or hyoscin three or four hours previous to the operation.

If local anesthesia is decided upon, use novocain in the strength of 1 per cent., or cocain, one-fifth of 1 per cent. This same operation can be performed with great ease to the operator and comfort to the patient by means of sacral anesthesia, as outlined in the chapter on Anesthesia (p. 53).

After-treatment. — The operation itself is only a small part of the cure, the after-treatment being fully as important as the operation. Any number of men can perform a perfect operation in a difficult case; but I have seen bad results follow the very finest work of the best surgeons, men of unquestioned surgical skill who stand at the head of the profession today, and I want to suggest why these cases result in failure. A perfect operation is performed, and the busy surgeon, not having the time (or perhaps the inclination) to do the after-treatment, turns the case over to his assistant. In all probability he is a young man with a laudable desire to do great things, but with a limited experience and only able as yet to do small things. The result is that the wound is frequently dressed in a haphazard manner, the fistula granulates, and in time has apparently healed. Soon afterward, however, there occurs an acute exacerbation, possibly an abscess; at any rate, the patient still has his fistulous tract.

What has happened? Some bridging very possibly occurred during the healing process, leaving a sinus beneath; or the outer portion of the tract has healed, with imperfect healing of the inner portion, resulting in apparent cure, the fistula reopening at some future time. The reason why the specialist gets better results in such cases is because he exercises a watchful supervision until the patient is thoroughly healed. If, at any time during the course of healing he finds, owing to pain or some other indication, that there is a collateral tract that has been overlooked, he immediately opens up that tract before the mischief goes any farther. He puts his finger in the rectum once or twice a week, noting any irregularity there. If there is any bridging, that bridge is broken down; he does not pack the fistulous tract; he does not necessarily apply any medication; but he keeps his eye on that fistula until it is absolutely well.

Horseshoe Fistula. — In the majority of cases a horseshoe fistula has its origin in a fissure of the posterior commissure; as the result of the fissure we have an infection; as the result of the infection we have an abscess in the triangular space, infection of one or both ischiorectal fossæ, and, finally, a horseshoe fistula (see Fig. 101). Of course a horseshoe fistula may result from any infection around the rectum, but the usual sequence of events is as described above. The external openings may be very numerous, but the internal opening is usually situated posteriorly and between the two sphincters. A horseshoe fistula may have its origin in the anterior quadrant; if so, it is much simpler to treat than the posterior variety, as it is generally superficial and the internal opening will be found just inside the external sphincter. The diagnosis can be made by injecting the tract with peroxide of hydrogen and methylene blue in the proportions already given.

Treatment.—The treatment consists in laying open the tracts outside the rectum until the posterior commissure is reached; afterward cutting through the sphincter posteriorly and converting the two lateral tracts into one, then packing with iodoform gauze and allowing the wound to heal by granulation. It is perhaps sometimes wise, particularly in these bilateral fistulæ, not to incise the tracts (at least on one side) clear to the posterior commissure, but to have a slight bridge of skin and subcutaneous

tissue to prevent the formal retraction of the cut sphincter. When the granulation of the fistula is nearly complete and holds the sphincter ends *in situ*, this bridge can easily be incised under a little local anesthetic. The details of the after-treatment have been given in connection with fistula in general.

After performing fistulectomy various operators have utilized a flap of mucosa drawn down from above the internal opening to prevent the inroad of infection from the feces during the healing process. In suitable cases this method has its value. Quite recently the same procedure has been brought into play by the adoption of the Whitehead operation to the other treatment of fistula (Arthur Elting, *Annals of Surgery*, 1912). The whole circumference of the rectum is dissected loose, removed at a level above the point of penetration of the internal opening of the fistula, and then brought down and sutured to the cutaneous margin. Thus the fistula is isolated from the lumen of the bowel, the sphincters are not severed, and the fistulous tracts, after more or less free incision and curettage, are allowed to close by granulation. This method has been successful and is of proved value in the hands of its chief advocate and others. If successful, the results are ideal, but it is open to the same objections and possible unpleasant sequences that are inherent in the Whitehead operation, except, or perhaps even, in the hands of expert surgeons.

Tuberculous Fistula.—A relatively small number of fistulæ are of tuberculous origin. Just what percentage of cases of pulmonary tuberculosis are complicated by tuberculous fistulæ can be ascertained only by consulting the records of hospitals devoted to the treatment of this disease. It must be remembered that fistula in a tuberculous patient is not necessarily tuberculous; neither does it follow that tuberculous fistula is always associated with pulmonary tuberculosis.

As a general rule it may be stated that a tuberculous lesion around the anus is rarely primary. In a large percentage of the cases there is usually some other focus and the abscess of fistula is commonly secondary. How the infection occurs it is difficult to say. Some claim that it is through the circulation; others, that the tubercle bacilli are swallowed and traverse the intestinal canal, eventually becoming implanted in fissures around the

rectum. It is entirely an academic question, and one that can be
settled only by a bacteriological and pathological examination
of the tissues in each suspected case. Unquestionably an error
in diagnosis very often occurs, and the fact that a case has the
clinical earmarks of tuberculosis is not sufficient as a basis
on which to build statistics. We have seen a number of fistulæ
that we consider tuberculous, and the majority of them had
pulmonary tuberculosis. The question came up, in these cases,

Fig. 89
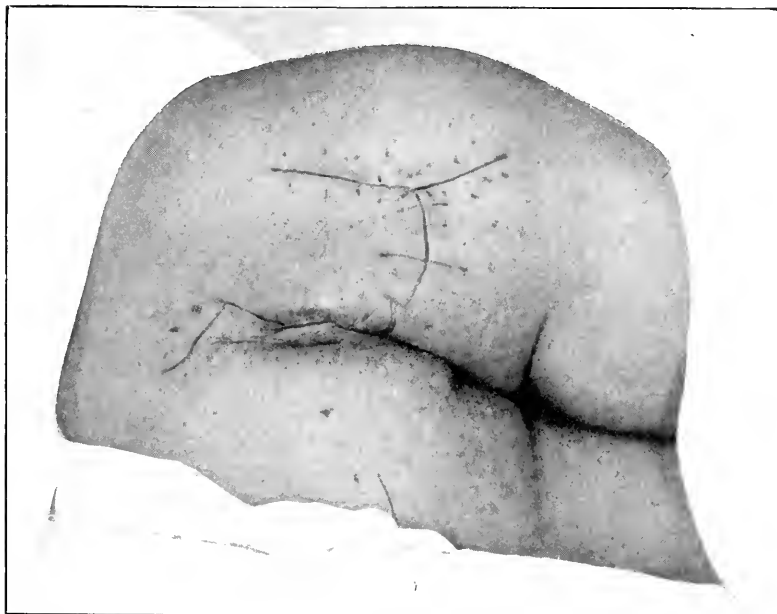
Extensive fistula involving the hip-joint. (Lynch.)

as to whether the patient would be benefited by an operation.
The patients were running a high temperature, and it was doubt-
ful whether surgery would be justifiable. It must be said, however,
that all the cases were benefited by operation, the cautery being
used. The temperature dropped, and they were in every way
improved. We cannot remember any case where operation aggra-
vated the trouble. The only excuse for separating the subject
of tuberculous fistula from general fistula is to impress upon those

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who see these patients the necessity of proper treatment. That tuberculous cases were injured by operation previous to the time when the cautery was suggested by Professor Hartmann, of Paris, there can be no question.

The tuberculous fistula is generally surrounded by an impenetrable wall of connective tissue, which is nature's method of protecting the organism against the invasion of the tubercle bacilli. If a section is made through a fistula of this character and examined under the microscope, tubercle bacilli, giant cells, leukocytes, and other evidences of tuberculosis will be found in the inner wall of the fistulous tract. But in the peripheral layer of connective tissue it will be found that the tubercle bacilli are absent. They have never been known to penetrate this wall, and it is on these findings that the treatment has been based.

Treatment.—Tuttle, Hartmann, and others, have observed that when this protective wall is laid open by the knife the patients died within a few weeks of general disseminated tuberculosis. Professor Hartmann, of Paris, therefore suggested that all such cases should be opened by means of the actual cautery. When Hartmann's method is followed, the bloodvessels and lymphatics are sealed, and there is no chance for subsequent infection through these channels. Another method of treatment which has proved successful in the hands of a good many surgeons, especially Hartmann, is complete excision of the fistulous tract, subsequently bringing the raw surfaces together by means of sutures. This procedure can be adopted without much difficulty where we have to deal with a simple straight fistula, but it is not a method to be advocated in an irregular or branching fistula. Nothing is lost by this complete excision of the fistulous tract, because, if an infection takes place later, the sutures can be removed and the wound allowed to heal by granulation; but to try to dissect out a tortuous fistulous tract is the height of folly.

Rectovaginal Fistula.—This fistula is one of the most distressing conditions that can fall to the lot of any woman, especially if she be a woman of refinement. It is generally the result of traumatism during childbirth, or infection of the glands of Bartholin, commonly known as vulvovaginal abscess. It is occasionally the result of a perirectal abscess which breaks into

the rectum first and subsequently opens into the vagina. If the opening is very small it may escape detection for some time and cause the patient endless suffering and distress. We have seen cases that were operated on more than once, and still the trouble persisted, because either the proper methods had not been pursued or the vaginal opening of the fistula had not been found. Women are so subject to leucorrheal discharge that they very often overlook this condition, assuming that it is part and parcel of what females have to suffer. Gonorrheal infection from the husband is often allowed to run its course, with all the distressing sequelæ, through the perfidy of the husband and the ignorance of the women; and this explains why so many women are invalided for life.

Etiology.—Infection occurs from the gonococcus or some other organism, and results in abscess and finally in fistula.

Symptoms.—The first intimation of the condition may be pain when the bowels move, with the discharge of pus and mucus from the bowel, and the passage of flatus, with or without feces, through the vagina; unless the opening into the vagina is large, feces will not pass into it except when the patient suffers from diarrhea. In a great many cases the vaginal opening is very small and is hidden in the folds of the vagina, so that only a little gas passes through, and this does not always cause sufficient annoyance to direct the patient's attention to the parts.

As a general rule there is tenesmus with a sense of weight and heaviness in the rectum, and an occasional show of blood when the bowels move. We have seen cases where the first symptom that the patient noticed was constipation and the passage of a little blood, mucus, and pus.

One patient had a pronounced case of prolapsing internal hemorrhoids with enormous skin tabs externally. To these she attributed all her trouble. She did not consider it worth while to consult a surgeon until she was threatened with intestinal obstruction. A stricture so narrow that it admitted only a probe was found about an inch and a half from the anus. Below this was an opening which readily admitted the index finger, which could be passed with ease into the vagina, yet this woman, on close questioning, stated that she had never passed any feces

through the vagina. She thought she had passed gas, yet believed she must have been mistaken at the time she noticed it.

Treatment.—Palliative measures are out of the question in a condition like this, unless, owing to the age of the patient or other contra-indications, such as disease of a vital organ where any surgical measure would shorten the life of the patient, some treatment merely for the amelioration of the suffering must be instituted.

The first thing to do under the condition we have mentioned is to clean the fistula and improve the drainage. If the fistula is not too large, a stout silk ligature that has been impregnated with silver nitrate is threaded on the end of a probe, and this is passed through the fistula and afterward tied loosely and allowed to remain in place. If it does not cause the fistula to heal, it will at least keep up the drainage and make the patient's life more comfortable. Such a ligature should be changed once a week, when a larger or smaller thread can be substituted according to the needs of the case. Another method worthy of a trial is the following: a little crystal of nitrate of silver is fused on the end of a probe and the probe then passed through the canal. This should be repeated at intervals of five days.

Colostomy has given very good results in the hands of the writer, particularly in those cases where there is extensive burrowing and considerable suppuration, precluding the possibility of a plastic operation. Indeed, in one case, the fistulous tract healed entirely.

Elastic Ligature.—An elastic ligature is passed through the elongated eye which generally exists on the proximal end of a silver probe. The probe is passed through the fistula and the rubber on the stretch follows the probe. Then, with the band under tension, the surgeon ties or fastens it by means of a leaded ligature. The ligature should be tightened about once in three or four days, and if this is kept up it will eventually cut through the fistula and the parts will gradually heal by granulation. Subsequently, when the fistula is clean, if desired, the perineum can be repaired under cocain or β-eucain anesthesia. On account of the retraction of the transverse perineal muscles the elastic ligature does not always give the best results, as a

sulcus is very likely to result. However, in the majority of cases
this can be easily repaired by a subsequent operation.

Beck's Bismuth Paste.—Injection of bismuth, prepared after
Beck's formula, is worth a trial in these cases. So far as our own
experience goes we have not found it useful in complete fistulæ,
but would, nevertheless, advise it as a preliminary measure. It
does some good, and, when properly administered, no harm.

Fig. 90

The bismuth shadows show the main features of the case.   (Jackson.)

The patient should be prepared in the following manner:
The vagina and rectum are thoroughly cleansed by means of
soap and water and irrigations. The fistulous tract is injected
with peroxide of hydrogen and afterward with salt solution.
A special syringe with a rubber tip should be used. It should be
boiled before using, and the tube containing the bismuth paste
heated until it is made liquid. The syringe is next filled with the
bismuth, and any remaining air expelled. The conical rubber
tip of the syringe is now engaged in the fistulous opening and the
bismuth paste gradually injected, the syringe being held in place
for some minutes until the bismuth hardens. This is repeated

Fig. 91

Showing vertical streak of bismuth not seen in Fig. 90.   (Jackson.)

Fig 92
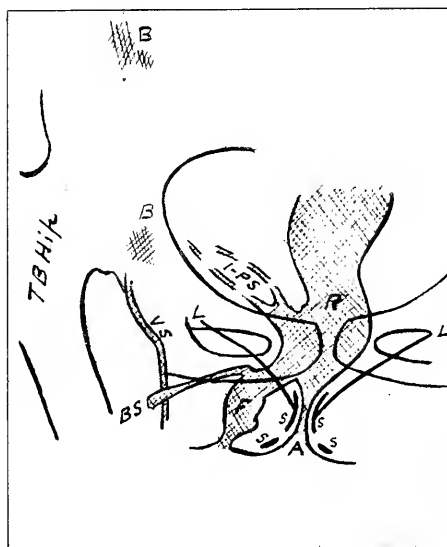
Diagram of all features.   *R*, rectum; *A*, anus; *F*, fistula; *BS*, buttock sinus; *VS*, vertical sinus; *I-PS*, intrapelvic sinuses; *B*, bismuth; *L*, levator ani muscles; *S*, external and internal sphincters.   (Jackson.)

about once a week until some result is obtained. Great care should be exercised when injecting bismuth as serious results may follow its improper use through forcing the bismuth outside of the fistula, carrying with it infection from the fistulous tract and causing the patient unnecessary suffering. There is also some danger that the bismuth may not reach the ramifications of the upper limit of the tract, and it may subsequently cause a damming up of the secretions and result in a secondary abscess.

Fig. 93

Bismuth showing descent of sinuses into pelvis from over the brim. (Beck.)

Surgical Treatment.—Preparatory treatment should be begun about one week previous to the time set for operation. This consists usually in frequent irrigations of the rectum and vagina, and cleansing of the fistulous tract as previously explained.

Operation.—The perineum is cut through until the fistula is reached; afterward, the fistula is dissected out, the tissues irrigated with salt solution, and the perineum brought together by means of buried catgut sutures. A flap of vaginal mucous membrane is dissected up and freed so that it will cover the

FIG. 94

Fistula with multiple external openings (six operations previous to coming under observation). Incontinence as a result of many operations. (Lynch.)

FIG. 95
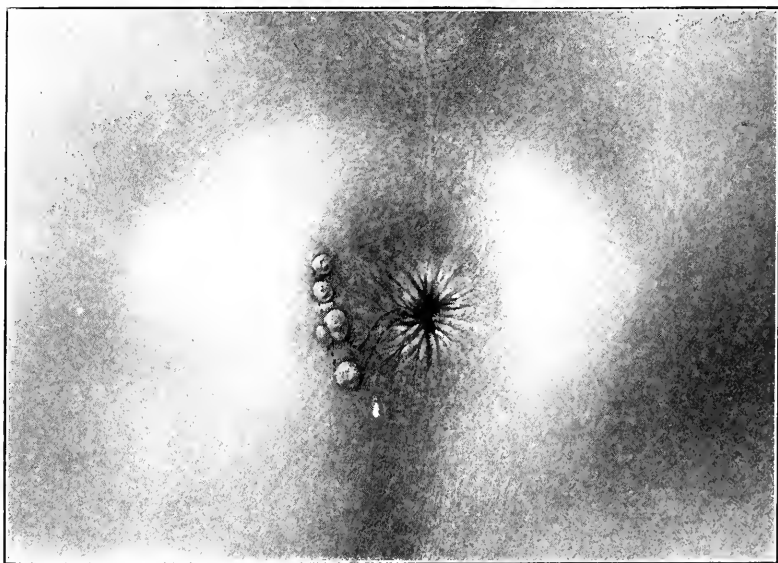
Fistula with five external and one internal opening. All the external openings communicate. (Lynch.)

vaginal wound and half of the perineal wound. The same process
is repeated in the rectum, the sphincter muscle having been pre-

Fig. 96
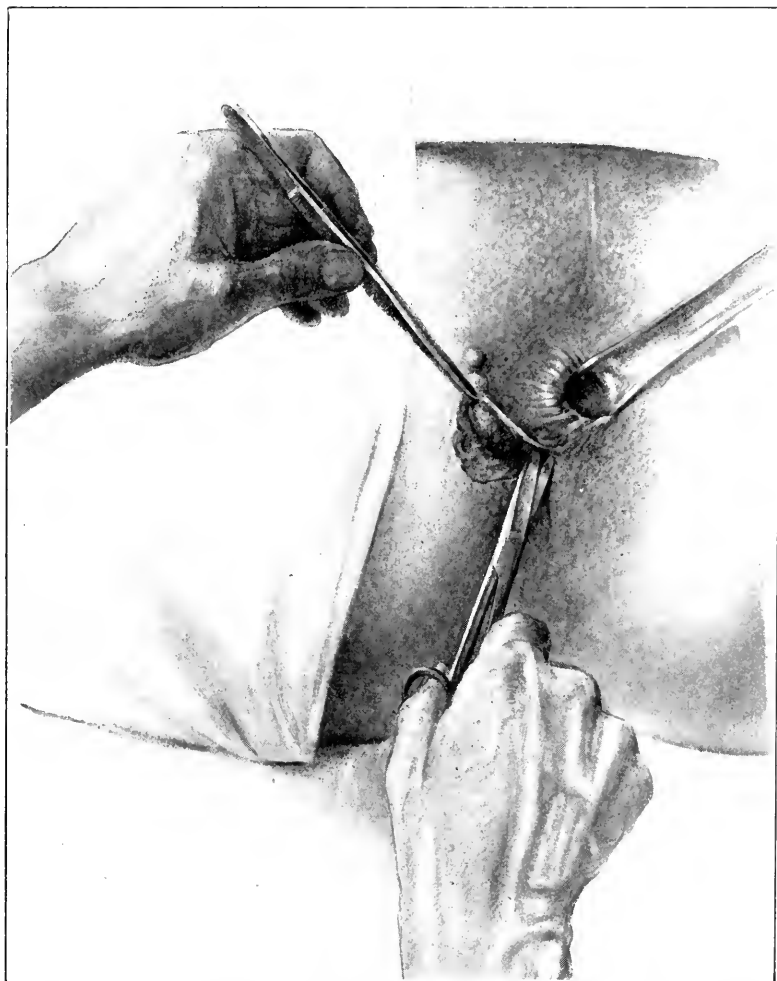
Drawing made at operation on case in Fig. 95, showing the method of excising
the fistula.   (Lynch.)

viously brought together by means of catgut sutures. The rectal
mucosa is brought out so that it covers the sphincter and the
other half of the perineal wound; it is then sewed to the vaginal

flap by sutures of Pagenstecher linen to complete the operation, a drainage tube is inserted into the rectum and around this some gauze placed, and finally gauze is applied to the perineum and held in place by means of adhesive straps. The bowels are confined for a week. At the end of this time, the patient is

Fig. 97
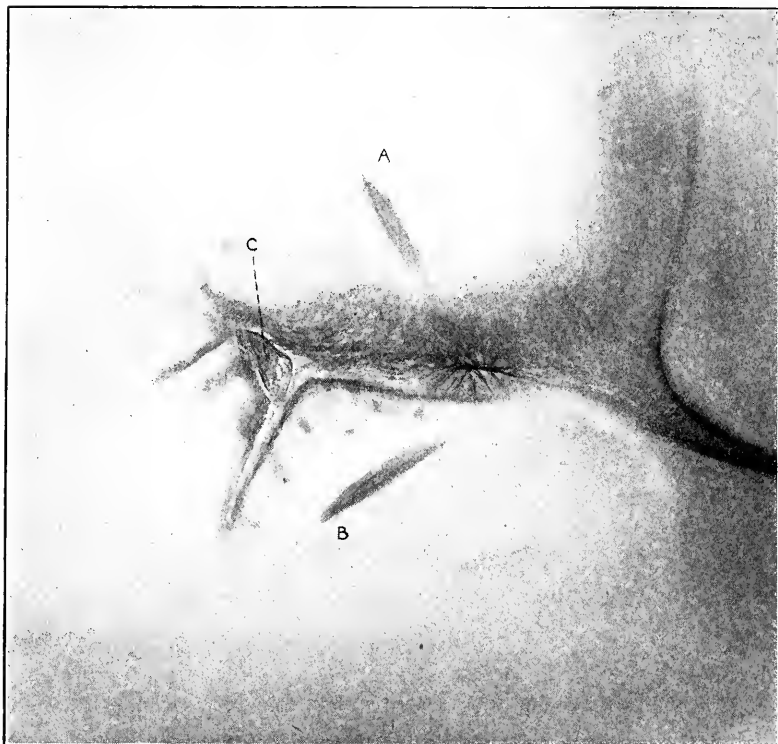
Drawing made after operation for fistulectomy. It required a plastic operation to bring the parts together. *A* and *B* are two incisions in the skin to relieve tension. (Lynch.)

given an injection of a 2 per cent. solution of hydrogen peroxide in water, or else olive oil, in order to empty the lower bowel. This is followed by a cathartic, one-half to one ounce of laxol, or Carlsbad salts, a teaspoonful in a glass of warm water on an empty stomach; or any other cathartic which the patient may have found from experience to agree with him, or which gives

Fig. 98

Extensive fistulæ following stricture of the rectum. (Lynch.)

Fig. 99
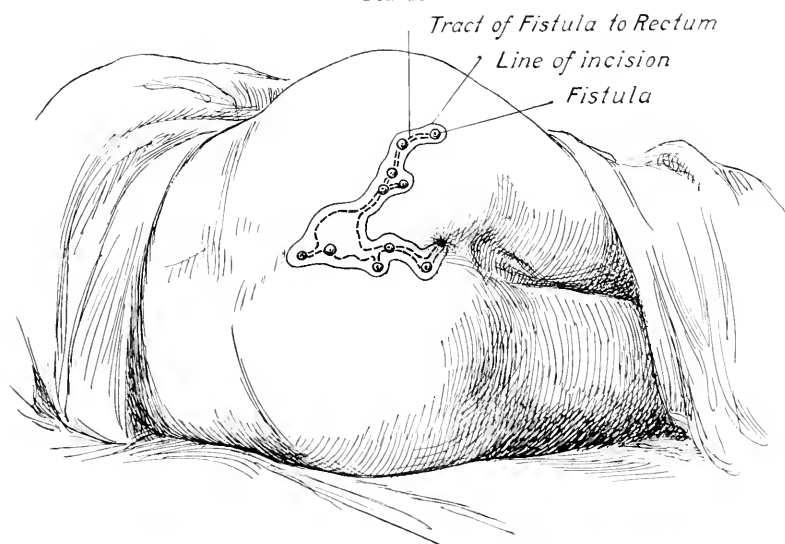
Diagram of case in Fig. 98. (Lynch.)

an easy passage. After the bowels have moved the parts are washed with saline solution, and this is repeated after each movement. The wound should have healed by the eighth day.

Recto-urethral Fistula.—This form is seen more frequently since perineal prostatectomy came into vogue. The writer has seen several cases that were the result of this operation, and in all probability due to an injury to the rectum during the operation or to suppuration afterward, and occasionally a sequel of prostatic abscess. Perhaps the next most frequent etiological factor is prostatic abscess breaking into the superior pelvirectal space and subsequently into the rectum. It may follow a superior pelvirectal abscess that has been improperly opened, or that has ruptured into the urethra, and subsequently into the rectum. This happened in one case that came under the observation of the writer. It occasionally follows a periurethral abscess, and has been known to occur from the introduction of foreign bodies into the rectum.

Symptoms.—The symptoms will depend, to a great extent, on the direction and location of the fistulous tract. If the urethral opening of the tract is higher than the rectal opening, the patient will suffer from burning in the rectum, tenesmus, and the passage of the urine through the anus with severe pain during a movement of the bowels. Occasionally gas will be passed through the penis, and fecal matter also; as a result of this, urethral infection occurs, which will extend back to the bladder, setting up a cystitis; and only with great difficulty can the patient obtain any degree of comfort. Occasionally an acute exacerbation will result in severe rigor, anal pain, tenesmus, and be followed by the discharge of pus. The pains during urination are sometimes unbearable. If the urethral opening is lower than the rectal opening, the patient may have all the symptoms, except the passage of urine into the rectum, but with probably greater susceptibility to the admission of fecal matter into the urethra.

Treatment.—There is no condition in the whole range of surgery that requires more skill on the part of the surgeon than the treatment of this condition. For a century some of the greatest surgeons in the world have attempted, and failed, to cure these cases. To Tuttle, perhaps more than anyone else, is due the

credit of having perfected an operation which has given good results in his hands. It has been the privilege of the writer to help him with eight of these cases, and all made excellent recoveries. The same operation in the hands of others has not always given such good results, but that is possibly accounted for by the fact of their being unfamiliar with the technique.[1]

Ziembicki[2] has suggested a very ingenious method of closing these fistulous tracts. He dissects the rectum free from the urethra and from its other attachments for about two inches above the opening into the rectum. He next closes the rent in the urethra and that in the rectum, after the scar tissue has been removed and the edges freshened. The rectum is now twisted on its axis so that healthy mucous membrane comes in contact with the urethral wound, after which the rectum is sutured to the skin. This rather serious operation is somewhat similar to one that has been suggested for incontinence following extirpation of the rectum for malignant growths. Numerous other methods have been proposed, but as they are practically failures we will not trouble to describe them.

Palliative Treatment.—It sometimes happens that, owing to the age of the patient or other contra-indication, or because he refuses operation, we find it necessary to employ palliative measures for his comfort. It has been the writer's lot to treat two such cases and, by the methods we are about to describe, to keep the patients fairly comfortable for an indefinite period. We have learned from experience that the regulation of the bowels demands the greatest care and judgment, because if the bowels move regularly and the stools are of proper consistency very little trouble will result, and we can keep the patient comfortable. All alcoholic liquors should be absolutely excluded, since alcohol, either by irritation of the kidneys or genito-urinary tract or by its influence on digestion, causes a lighting up of the trouble. At the onset of an exacerbation the patient should be carefully watched, the bladder irrigated with warm boric acid solution, and urotropin given by the mouth in increasing doses, mixed with benzoate of sodium. The rectum should be irrigated with warm

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[1] See Tuttle, Diseases of Anus, Rectum and Pelvic Colon, 2d edition, p. 435.
[2] Cong. Franc. d. Chir. Proc. Verb., 1889, iv, 295.

saline solution and the following ointment used in the anus to prevent straining at stool and to relieve the burning:

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℞—Argyrol  .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   ℥j
    Ichthyol   .   .   .   .   .   .   .   .   .   .   .   .   .   .   gr. xxv
    Anesthesine .   .   .   .   .   .   .   .   .   .   .   .   .   gr. lxx
    Vaseline  .   .   .   .   .   .   .   .   .   .   .   q. s. ad   ℥j
M. et ft. ungt.
Sig.—Apply twice daily.
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If this routine is followed the irritation subsides in a few days and the patient may resume his usual pursuits. It has been our experience that if diarrhea can be prevented very little inconvenience will result from the fistula. Of course, we are not speaking of those severe cases where the opening is very large, and where fecal matter is passing into the urethra, or urine into the rectum. In such cases it is most difficult to do anything to improve the patient's condition, and nothing short of an operation gives relief.

Inguinal Colostomy has been suggested in order to short-circuit the fecal current and prevent infection of the urethra or bladder, and to put the patient in better condition for subsequent operations. It may be necessary to perform this operation on cases where previous surgery for the radical cure of fistula has failed, and where there is very little chance of doing anything more; but we believe it should never be undertaken until after the radical operation has been attempted.

Rectovesical Fistula.—This form of fistula does not occur very often, but when it does it is a very serious condition, on account of the danger of an ascending infection into the kidney and the difficulty attendant on an operation for its radical cure. It most frequently arises from diverticulitis of the sigmoid or malignant growths matting the sigmoid and bladder together, and terminating in rupture and communication between the two organs. In one case seen by the writer an inflamed tube produced the same condition, and occasionally such a fistulous connection may result from the perforation of a pelvirectal abscess into both the rectum and bladder.

Symptoms.—The symptoms depend to a great extent on the direction of the opening. If the opening in the rectum or sigmoid

is at a lower level than the one in the bladder, the symptoms will be less severe than if it were higher. In the former case the urine gravitates into the rectum and, except for some irritation, there will be very few symptoms. However, it must be remembered that gas will occasionally pass into the bladder, causing some irritation of that organ and the urethra, with pain and tenesmus. An opening of this kind, after it has existed for some time, is bound to infect the bladder, and bacteria pass from the opening into the viscus, resulting in cystitis.

When the opening into the bowel is higher than that of the bladder the symptoms are more marked and more serious, especially if the communication is large. In such a case the first intimation of trouble, excluding the primary cause, is some irritation of the bladder, followed by the passage of feces and gas through the penis. In some cases a lighting up of the trouble is ushered in with a decided rigor, with pain referred to the anus. At other times there is a chilly sensation with rise of temperature followed by tenesmus, local pain, and the passage of pus, feces, and gas. During this period the urethral tenesmus is very severe, and the patient much exhausted after an attack.

The writer had the privilege of observing one case of sigmoidal fistula for five years, and, except during the acute exacerbations, the patient was comparatively comfortable. A frequent examination showed the urine during the quiescent period to be remarkably good, considering the amount of inflammation, and except for a faint trace of albumin it contained nothing unusual. The following summary gives a good idea of the condition:

"The specimen contains a faint trace of albumin, due to the presence of pus and blood, no renal elements microscopically, and no sugar. The red-blood cells are unaltered and probably come from the lower urinary tract. The bacteria present are very numerous and are rod-shaped. No tubercle bacilli found. A few muscle fibers found. The quantitative determinations show no decided variation from the normal."

Diagnosis.—There are several methods of diagnosing rectovesical from recto-urethral fistula. When an opening in the bladder communicates with the rectum, urine is constantly found in the rectum; when the opening is in the urethra, it occurs

only during micturition. One of the best methods is cystoscopy. The instrument is first passed into the bladder, with the patient in the exaggerated lithotomy position; a small catheter is passed into the rectum and through this a solution of peroxide of hydrogen and methylene blue is injected. Through the cystoscope, if there is an opening between the rectum and bladder, the color can be readily seen, as the peroxide will carry the methylene blue into the bladder. If the opening is in the urethra, the same plan can be followed, using an urethroscope instead of a cystoscope. If the sigmoid and bladder communicate, this method will also work well.

Tuberculosis of the bowel may result in the formation of a fistula between the bladder and rectum. Such a condition is more serious than any of the preceding etiological factors that have been mentioned, and must be eliminated in all cases before radical measures can be taken for the relief of the fistula.

Prognosis.—The prognosis depends in a great measure on recognizing which portion of the bowel communicates with the bladder. The writer has collected 94 cases of enterovesical fistulæ from the literature. In 45.9 per cent. of these cases, the intestinal opening was found to communicate with the rectum; in 27 per cent. with the sigmoid; in 17.7 per cent. with the small intestine; in 5.9 per cent. with the large and small intestine; in 2.3 per cent. with the appendix; and in 1.2 per cent. with the cecum. From this we can see that the rectum is the most frequent site, and, apart from penetrating wounds, superior pelvirectal abscesses are probably the most prominent etiological factor in the causation of rectovesical fistula.

In the majority of cases it is extremely difficult to differentiate between recto-urethral and rectovesical fistula. In recto-urethral fistula the discharge comes down from the urethra into the rectum, but this may vary a great deal because, if the opening into the rectum is higher than the opening into the urethra, one is much more likely to have a discharge of fecal matter into the urethra than of urine into the rectum. This also applies to rectovesical fistula, but as a rule the discharge is nearly always from above into the bladder. In the former case, cystitis is much more rare, naturally, than it would be in the

latter. Again, in urethrorectal fistula the opening is generally low down and within reach of the finger, whereas in the other form the opening is usually very high up and cannot always be seen, even with the sigmoidoscope.

Treatment.—The treatment of this condition will depend, to a great extent, on the general condition and age of the patient, the location of the fistula, and the causative factors. In a very poorly nourished individual, or one advanced in years, any radical measures would be out of the question. In such cases palliative measures are the only recourse, and a great deal can be accomplished through them, especially by diet. No food should be taken that is likely to cause diarrhea, as, when the movements are fluid, fecal matter is much more likely to reach the bladder or urethra than when they are well formed. A daily irrigation with normal saline or a weak solution of peroxide of hydrogen or boric acid will help a great deal toward keeping the bowel clean, evacuating it at one sitting, and preventing infection of the adjacent organs. Urotropin in suitable doses, especially when there is a lightening up of the trouble, will be of great benefit if, at the same time, the bladder is irrigated with some bland solution such as boric acid or permanganate of potassium, the strength of the latter being about 2 grains to a pint of water.

Diversion of the Fecal Current.—If the opening is in the sigmoid or rectum, even if the patient is very much run down, a colostomy can be done under cocain anesthesia with very little inconvenience or risk, and this surgical procedure is preferable to constant toxemia or an ascending infection. Of course, one cannot say positively that all infection can be excluded by diverting the fecal current, but it can be greatly diminished, if not entirely eliminated, as it is very much easier to keep the bowel clean, and the bacterial flora in the excluded bowel can be reduced to a minimum. Diversion of the fecal current has another advantage, as by putting the parts at rest the fistula may heal and entirely disappear. It has the further advantage of putting the patient into a better condition to withstand a radical operation, if that should be considered wise at some future time.

The location of a fistula and the causative factors will undoubtedly influence the surgeon as to the measures to be taken

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for its relief. A fistula between the rectum and bladder is not so accessible as an opening between the sigmoid and bladder, or the small intestine and bladder, or some other organ. In such a case an abdominal operation with a good view of the field is much easier and more efficacious than a perineal operation.

We cannot hope to accomplish much in the case of a fistula due to a tuberculous infection. Under such circumstances the treatment resolves itself into measures for the temporary relief of the patient, especially as primary tuberculosis of the bowel is very rare, the patient usually having a focus in some other part of the body, and not being likely to live very long. Again, in a fistula due to a malignant tumor, much relief cannot be expected, as the probabilities are that the adjacent organs are also involved. Not that this would contra-indicate a radical operation, if the infection were not too extensive, but that such a patient, with cancer and a bowel toxemia combined, would be very unlikely to stand any kind of a radical measure.

Surgical Treatment.—If the communication is between either the sigmoid, small intestine, or appendix and bladder, the surgical treatment is practically the same. As the sigmoid, next to the rectum, is the organ most frequently involved, we will give a detailed description of the operation used in this form of fistula, a somewhat similar procedure being followed in the case of the other organs.

Median Incision.—After the abdomen has been opened, the small intestines are thoroughly walled off with gauze pads, and the abdominal wound and pelvic organs, other than the bladder, also protected by gauze pads, so that in case of leakage of urine or feces infection will be avoided. After this has been done, all adhesions are carefully broken up, and the sigmoid is dissected away from the bladder until the fistulous opening is reached. This is cut through, a plug of gauze inserted in the sigmoidal opening and the bladder temporarily clamped to prevent the escape of urine. The dissection is continued until the sigmoid is freed from the bladder. The next step consists in dissecting the fistula from the bladder wall, and closing the wound in the bladder by two layers of Lembert sutures. The opening into the intestine can be closed, or the intestine can be brought up to the

abdominal wound and the peritoneum brought around it, the fistula being allowed to heal of its own accord; or, if the sigmoid is unusually long, it can be brought outside the abdominal cavity after both limbs have been sutured together, as is done in the three-step operation for cancer. Whatever method is adopted, the sigmoid should be sutured to the abdominal wall to prevent its falling down and becoming adherent to the bladder.

If the small intestine is involved, it is much safer to resect the diseased portion of the bowel afterward, rather than try to close the fistulous tract, as a fistula is liable to result when the former precedure is adopted.

In the case of the appendix, it is removed after the fistula and bladder have been treated, as in the case of the sigmoid.

In operating for urethrorectal fistula, the procedure is much more difficult. Several methods have been suggested, such as dissecting the rectum free from the urethra, prostate, and bladder; closing the wound in the bladder as in the former operation; closing the wound in the rectum, or simply packing the space between the rectum and the bladder and allowing the fistula to heal by granulation. If the opening between the bladder and rectum is just below the perineal reflection it might be safer and easier to approach it from above. In such a case, after the abdominal cavity has been opened and the pelvis, including the small intestine—thoroughly walled off and a gauze packing placed therein, the peritoneum is separated between the bladder and the rectum, and the bladder dissected free from the rectum, until the fistulous tract is reached. After this has been done, the opening into the bladder can be closed by Lembert sutures and the rectum treated in the same manner. The operation is completed by sewing the peritoneum over the bowel and closing the abdominal wall in the usual manner.

If such a method is adopted it will be found safer, subsequently, to go down below and make an opening between the rectum and urethra, cutting through the levator ani muscle and placing a small drainage tube in the superior pelvirectal space. Another way is simply to perform a colostomy, diverting the fecal matter temporarily; this has been followed in many cases by the closing of the fistulous tract.

In cases of recto-urethral fistula the patient is prepared before-
hand for the treatment by irrigations of peroxide of hydrogen
twice daily; daily irrigations of the urethra and bladder, and
urotropin in doses of $7\frac{1}{2}$ grains every four hours for several days
previous to operation. The perineum is prepared in the following
manner the night before operation: the parts are shaved and
washed off with green soap and water, afterward with alcohol,
and a dry dressing applied. After the patient has been placed

Fig. 100

Fistula with fifty external openings. Before operation. (Lynch.)

under anesthesia, and just before the operation, the perineum
is painted with tincture of iodine. An incision is then made in
the rectum in the middle line anteriorly, and carried through
into the urethra. Another incision is made from the scrotal
junction of the perineum into the fistulous opening, thus leaving
one incision from the scrotum to the rectum. The parts are
now thoroughly retracted and the cicatricial tissue around the
entire fistula trimmed off with scissors. The intestinal wall is

next dissected from its anterior attachment for about $\frac{3}{4}$ of an inch above the fistula, and for $1\frac{1}{2}$ inches on each side. A flap is then dissected from the soft tissues on either side of the urethra large enough to replace that portion of the floor of the urethra which has been destroyed. A steel sound is now placed in the bladder, about a No. 30 French, and the right or left flap sutured over the sound to the base of the other flap. The second flap is sutured over the first, and other flaps are taken from the outside and placed over the first flaps, entirely surrounding them and making a sort of cuff to the first area sutured.

Fig. 101
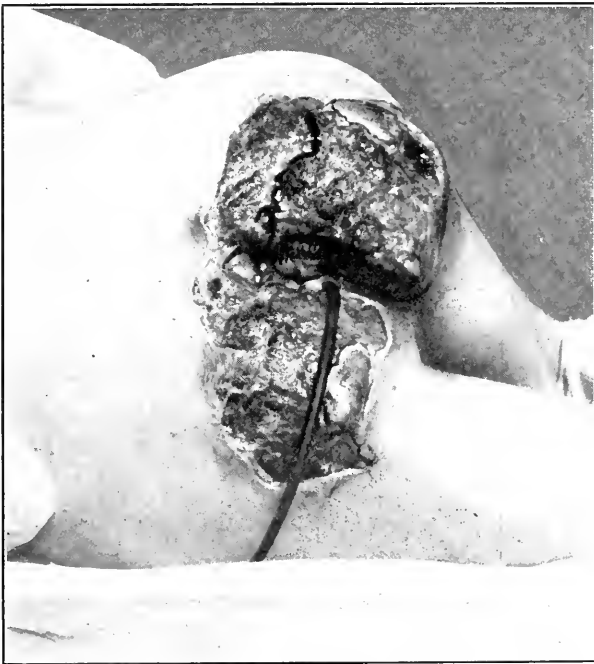
The case shown in Fig. 100 one week after operation. (Lynch.)

The next step in the operation consists in sewing the entire thickness of the intestine with chromicized catgut down to the external sphincter muscle. When the external sphincter is reached, the mucous membrane is dissected loose and sutured to the skin, but the sphincter muscle in front is not brought together, the

object of this being to allow free escape of feces and gas and
to prevent any tension on the wound. A soft rubber catheter
is next introduced into the urethra and allowed to remain *in
situ* for several days, the bladder being drained in this manner.
After the catheter has been placed in the bladder, the skin over
the wound is closed down as far as the catheter, but the opening
to the urethra around the catheter is not closed. A drainage
tube is placed in the rectum, and some gauze loosely packed
around it.

Fig. 102
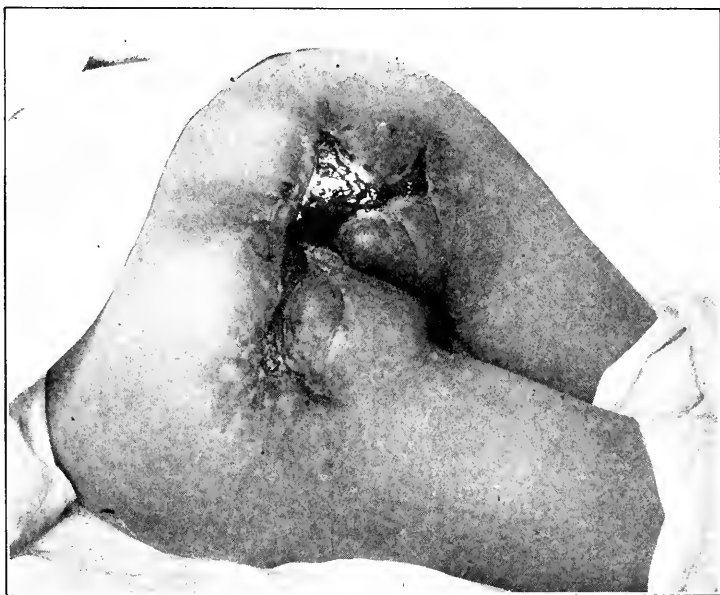
The same case four weeks after the operation.   (Lynch.)

Still another class of fistula cases, very rarely seen, presents
some of the most difficult proctological problems. We refer to
suppurative processes of extrarectal origin, resulting in intra-
rectal rupture. In women some of these arise from periuterine
infections but most of them are of tuberculous character, and
come from diseases of the vertebræ, or of the sacro-iliac or hip-
joints. The rupture of such abscesses into the anus is bad enough,
much worse if above the sphincter, and worst of all if, besides
the intrarectal opening, they also burrow downward and

discharge externally. This means a complete fistula, plus infection pouring in from the original and often incurable source, thus vitiating any of the ordinary methods of operating on fistula. Bismuth paste and radiography may be of great assistance in completing the diagnosis of such cases and locating the primary lesion. All fistulæ of this type must be treated individually and with uncertain results; but if a cure is to be obtained the severance of both sphincters must be made, with all the attendant dangers of anal incontinence.

Fig. 103

The same case two months after operation.   (Lynch.)

Extrarectal suppurative conditions, such as periuterine infections, spinal or sacro-iliac disease, occasionally find an outlet into the rectum. The resulting sinuses are persistent, and if originating in bone disease are almost incurable; and furthermore,

by added external rupture, they may be productive of a most serious type of fistula. The possibilities of such processes originating from an even more remote source are illustrated by the following abstract of a case report:

Male, aged thirty years, with phthisical family history, developed tuberculous coxitis in early childhood, which was followed as usual by multiple sinuses of the thigh, partial ankylosis of the joint, etc. At length a pararectal abscess developed which

Fig. 104

Same patient six months after operation.   (Lynch.)

ruptured first into the rectum well above the internal sphincter, and then pointed externally and was opened 6 cm. from the anal margin. With considerable difficulty, by the use of bismuth paste injected into the sinuses, radiograms (see Figs. 90 to 93) were secured, showing the pathological process. The pus, originating in the joint, had burrowed forward, followed the iliopsoas upward over the brim of the pelvis, into which it had descended above the levator ani and discharged into the rectum, and lastly

perforated the levator to reach an external outlet. The treatment involved tedious effort to close large lateral burrowings, and at length the necessity for complete severance of both sphincters. The patient's condition, as stated one year later, was one of great improvement in general health, with the fistula healed and with the maintenance of a fair degree ofith a control, but, of course, with the sinuses from the hip, from which the whole trouble began, still open and possibly discharging. The closure of these would of necessity be a matter of time, and be dependent upon the subsidence of the primary lesion in the joint (*Boston Medical and Surgical Journal*, Aug. 22, 1912, pp. 242-246).

Complications.—The complications to be found associated with fistula are as follows: shock, sepsis, retention of urine, involuntary defecation, incontinence of feces, prolapse of hemorrhoids and mucous membrane, protracted suppuration and extensive burrowing, and premature and irregular healing.

1. In a patient very much exhausted by continued suppuration, a prolonged operation for fistula, together with the after-effects of the anesthesia, may result in *shock*. This is, however, an extremely rare complication.

2. *Sepsis*, which is a rare complication, does occur occasionally, and results from the opening of bloodvessels and lymphatics, with the production of foci either near to or remote from the operative field. The wound may become directly infected, or septic emboli may be carried to a distant point supplied by the portal circulation with consequent abscesses, especially of the liver.

3. On account of the intimate nerve association between the urethra and the rectum, any operation on the latter is followed, in 90 per cent. of cases, with a temporary *retention of urine*, caused by spasm of the compressor urethræ muscle and the neck of the bladder. This, in a great measure, is due to the fact that branches of the long pudendal nerve supply both the sphincter and the compressor muscle. This condition is especially marked when the anus is blocked with gauze. Any attempt at urination following a rectal operation is likely to result in spasm of the sphincter with reflex spasm of the compressor and the neck of the bladder. For obvious reasons retention is more common in males than in females. It is a good plan to give urotropin before

all rectal operations, as catheterization, necessitated by these circumstances, is less likely to result in sepsis. Catheterization, particularly in hospital practice, is apt to lead to sepsis unless the most rigid cleanliness is observed. The colon bacillus is the most frequent offending organism in these cases. Here, again, urotropin is of infinititis iilue and should be administered in very large doses; anywhere from 60 to 100 grains daily is necessary in order to overcome the infection. Autogenous vaccines are also helpful.

4. *Involuntary Defecation* may result before the patient comes out of the anesthesia, and is not of very serious consequence, except in cases where excision and immediate suturing has been practised. When this complication does occur, the parts should be thoroughly irrigated with normal salt solution, the wound repacked and a fresh dressing applied.

5. *Incontinence of the Feces* is the most serious of all complications of fistulotomy. In most cases it results from an imperfect operation. The writer believes that incontinence rarely results if the internal sphincter is not damaged. This may seem strange but is a fact, nevertheless. The internal sphincter is involuntary and its normal state is contraction. In the experience of the writer, when this muscle is intact, very little inconvenience results. It should not be understood from this that one can, with impunity, cut the external sphincter. The greatest care should be exercised in incising either, and the internal muscle should never be cut except when it is absolutely necessary. A good many cases of incontinence result from cutting the sphincter obliquely instead of at right angles. As a result, when the fistula is healed, imperfect apposition and faulty union have taken place between the severed ends. If it is necessary to cut either of the two muscles in order to cure any fistula, the patient should be told, so that he may decide beforehand whether he will undergo the operation or not. Incontinence is too serious a trouble to be treated lightly, and where there is any possibility of its occurring the patient should be forewarned. Partial incontinence sometimes results from overstretching the sphincters at the time of operation, or from the removal of the sensory bodies, or papillæ, with the consequent lack of appreciation of the passage of gas or feces.

This condition should right itself in a short time; it can be helped by electrical treatment, and usually does not require any radical or operative measures for its control.

6. On account of the stretching or cutting of the muscle at the time of operation, or because of the subsequent tenesmus, *prolapse of the mucous membrane*, with a marked protrusion of hemorrhoidal tissue, frequently follows an operation for fistula. The hemorrhoids may not be apparent before the operation, and as it is not always well, even if they are present, to operate on a fistula and hemorrhoids at the same time, because of the danger of subsequent infection, this condition must be looked on as an unavoidable complication. It is not a complication in the sense that it is liable to result in detriment to the patient, because treatment with astringent ointments, local applications and hot fomentations, will ordinarily relieve it. It is a complication only in the sense that it gives the patient temporary inconvenience or pain. It is mentioned principally in order that those who are not very familiar with cases of this class may know what to expect, and need not be alarmed when hemorrhoids and prolapse of mucous membrane follow an operation for fistula.

7. Occasionally, after a fistula has been opened, it will continue to suppurate for an unusually long time. This may alarm both patient and surgeon, but unless the protracted suppuration is accompanied by pain it is generally due to a low resistance on the part of the patient. Suitable local applications—particularly balsam of Peru, 10 per cent., in castor oil, tincture of iodine, or ichthyol, either pure or in an ointment in percentage varying between 5 and 10 per cent., will cause a more healthy growth of granulation tissue, and the suppuration will subside.

Following an operation for fistula, extensive burrowing may take place for some time, on account of a virulent infection. However, in the majority of cases, it is confined to the skin, and can be avoided if thorough drainage is established at the time of operation. If it continues for any length of time after the operation it is usually due to some pocketing, and can be corrected when this is found, opened and drained.

8. Premature and irregular healing is the most frequent complication following operation, and is principally due to the fact

that a careful watch has not been kept on the patient. There
is hardly any doubt that this is the most frequent cause of failure
to cure fistula. Nothing in surgery requires more unremitting
attention and watchful supervision than the wound following
an operation for fistula. Irregular healing is due to the tendency
of the muscle to contract, and to the imperfect approximation
of the wound. All this can be avoided if the surgeon will examine
the wound about once or twice a week with the index finger.
Any irregularity can then be detected, and if there is any bridging
it can be broken down until the surface is perfectly smooth.

Severe pain coming on a week or two after the operation is a
sure indication that something has gone wrong. It is then the
duty of the surgeon to examine the patient thoroughly, because
probably he has overlooked some burrowing tract, and the
fistula has not been completely opened. He should not hesitate,
if necessary, to give his patient an anesthetic and find the cause
of the trouble. He must exclude the pain which occurs posteriorly,
as this is due to exposure of some of the terminal filaments of the
coccygeal nerve. This pain is sometimes very severe, but can
easily be corrected by an application of nitrate of silver. The
pain we particularly refer to is a dull, aching pain in the rectum,
accompanied by a slight oozing of pus. These two conditions
combined always indicate an imperfect operation.

CHAPTER X.

PRURITUS ANI.

PRURITUS ANI is an exceedingly common and distressing condition concerning which much has been written. It is a painful itching about the anus and its only pathology is a change in the perianal skin. Recently this has been amended by Murray, who claims that the skin condition is a low-grade inflammation due to infection by *streptococcus fæcalis*. But then it must be borne in mind that the late Sir Frederick Wallis claimed that in some cases he found pruritus a primary condition, characterized by the presence of an ulcer situated in the posterior median line between the two sphincters. In the light of all that has gone before, the writer chooses to consider pruritus ani a condition due to an irritation of the anal or perianal skin, whether this irritation be parasitic, coccogenous, nervous or dermatitic.

Etiology.—The writer feels that in naming the etiological factors in this condition the important consideration is the treatment. Therefore this etiological classification is only to serve as a guide to the proper therapeutics. The first class we term the *poikilogenic pruritus,* following as it may a multiplicity of causes. The second class is the *coccogenous pruritus*, where there is present a streptococcic infection of the skin. This may be considered an etiological group, as in some cases of pruritus ani the *streptococcus fæcalis* is found in the perianal skin, and there is no other apparent causative agent. However, that no lesion is apparent is no proof that a lesion never existed. Cases of pruritus are characterized by chronicity and tendency to recurrence. How reasonable it is, then, to suppose the presence of a rectal lesion causing an irritation of the dermal layer. This irritation induces scratching, and continuous scratching results in an infection due to some organism whose habitat is near to, or in, the It. Quite analogous is the infection following

a mosquito bite. The infection results from scratching and is not due to the bite of the mosquito; and, as such cases must be treated for the infection present, disregarding the cause, so the all-important point in pruritus with infection present is to treat the infection. And as all mosquito bites, though scratched, may not become infected with a pyogenic organism, so all cases of pruritus do not necessarily become infected.

Poikilogenic Pruritus Ani.—In this class almost every disease has been suggested as a possible etiological factor. One condition, however, is always present, and that is congestion. Whether this is simply a vasomotor condition of toxic origin, or whether it is due to some obstruction causing congestion in the portal circulation, is a question we are not ready to decide. That itching is coincident with the formation of epithelium, is a well-established physiological fact, an instance being the itching character of healing wounds. Whether or not this is only a chemical process inherent in the epithelial cells we are likewise unprepared to say.

Most authors express their belief that rheumatism, gout, uricacidemia and diabetes are prominent etiological factors. This is quite possible; but it would seem more likely that they are coincident, merely manifestations of disturbed metabolism.

Shell-fish, strawberries, and other articles of diet, will cause severe attacks of pruritus and hives in some people. Unquestionably this is a toxemia of intestinal origin or anaphylaxis. Tuttle relates the case of a man who had a severe attack of pruritus every time he ate strawberries, and almost every physician of experience has seen similar cases.

In the experience of the writer, the most frequent local conditions which may be grouped as causes of prutitus ani are hypertrophied papillæ, cryptitis, hemorrhoids, moist eczema, eczema marginatum and *oxyuris vermicularis;* and less frequently, fissure and specific disease (gonorrheal proctitis).

Hypertrophied papillæ are frequently mistaken by the patient for worms, and this is not to be wondered at, as the symptoms are quite similar. These little bodies (papillæ) are composed of erectile tissue and bloodvessels, and when irritated are apt to become very much enlarged, so that they   wn during

defecation and cause a tingling and itching sensation in the anal canal.

Cryptitis is undoubtedly a cause of pruritus ani.

A moist eczema, due to a local discharge, will occasionally cause most intense itching. The writer has frequently seen this form of eczema in women suffering from leucorrhea or other infections of the vagina.

The eczema marginatum of Hebra, which is a parasitic disease, sometimes results in severe itching. The cause of this condition is found in the superficial areas of the skin.

Hemorrhoids are frequently associated with itching, so much so that the lay public have given it the name of itching piles.

There is no question but that the presence of thread-worms can cause the most intense itching, and should always be considered when looking for a cause of pruritus ani, especially in children. The writer has also seen them frequently in adults. It has been pointed out by Heller that the natural habitat of these worms is the cecum and lower portions of the ileum. He has been able to demonstrate that the females, when about to deposit eggs, gravitate down to the rectum and there set up an irritation which results in itching. Heller believes that these thread-worms are not reproduced in the intestines, as the presence of gastric juice is necessary to soften the covering of the eggs and allow the parasite to escape. He believes that the eggs are conveyed to the mouth by the fingers, being deposited upon the fingers when scratching the perianal region.

Pediculi and other parasites may cause a pruritus. Imperfect cleansing of the parts after defecation, especially where skin troubles or external hemorrhoids exist, will sometimes result in severe itching. This is due to a local irritation, and may be the starting-point of infection, as noted under the coccogenous group.

Catarrh of the bowels, internal hemorrhoids and local ulceration all play their role in causing pruritus.

A proctitis, causing as it does an irritation of the rectum, may, by reason of the nerve distribution to the lower inch of the rectum and to the perianal region, cause a reflex itching in this area. A foreign body in the lower part of the rectum might have the same result.

It should be remembered that these are all causes which result in the cardinal symptom of pruritus, and they may fail to show the presence of any localized infection. On the other hand, some of the lesions mentioned may be present, and in addition the pruritic area may reveal the presence of infection.

Symptoms and Diagnosis.—The patient comes to the physician complaining of an itching in the anus or in the perianal region. The itching is always worse at night after the patient has retired to the warmth of his bed, and in most cases the itching is of a character not relieved but intensified by scratching. Fortunately for the sufferer, the irritation is not constant, and there are periods of complete relief. Care must be exercised, however, that these periods are not confounded with permanent cure; in fact, one must be conservative in his promises.

The diagnosis is made after hearing the patient's story and examining the parts. The patient is placed on his left side with knees and thighs flexed. The nates are then separated. Usually the skin condition is characteristic. Moisture may or may not be present, but there are always cracks or fissures varying in length and depth; the entire area of the skin involved being red, dry and almost parchment-like.

Treatment.—The most important points to be observed in the treatment of pruritus ani are:

1. The parts should be kept scrupulously clean.

2. After the bowels have moved, the rectum should be irrigated either with a few ounces of a solution of boric acid, 5 per cent.; a normal salt solution; or a 20 per cent. solution of witch hazel.

3. Protection against discharge of any kind, or irritation from clothing. When the skin is dry and brittle an ointment of oleate of mercury, applied in the following manner, is helpful. A thin coating of the ointment is smeared on a piece of cotton and the cotton is applied to the parts. It should be removed in about twelve hours, the parts cleansed with 50 per cent. alcohol, and then the ointment applied again. When the skin is macerated, moist, and boggy, three or four exposures to the x-rays will sometimes result in a cure. One such cure came under our observation several years ago. We had tried every conceivable remedy, with very little encouragement, when the patient went

to visit a brother in Boston, who is a medical man. His brother gave him some *x*-ray treatments, and he returned entirely cured. Since then we have tried it several times, but not with as great success. We relate this method, however, as worthy of trial.

All cases of pruritus ani should be given a thorough local and general examination. The cause having been determined, the treatment is conducted along lines which will bring about relief of the underlying conditions. If the presence of local infection is established, autogenous vaccines should be used, irrespective of the fact that other lesions may be present. At the same time, any other local or constitutional condition found must also be treated, because, though the patient is afforded relief by the use of vaccines, recurrence may take place.

To determine the presence of infection, the parts are first scrubbed with soap and sterile water, then washed with saline solution. A sterile swab is next swept over the cleansed area or a curette used to scrape the superficial areas of the fissures. The material thus obtained is plated on some agar medium and placed in the thermostat for twenty-four hours, though if streptococci be present the growth should be luxuriant in twelve hours. The usual laboratory means are employed to isolate the germ and grow it in pure culture. Murray has found the *Streptococcus fœcalis* as the predominating germ in most of his cases so examined. The writer, in a large series of cases, found the *Streptococcus fœcalis* less frequently than the *Bacillus coli*, and in three cases the *staphylococcus* was isolated. Irrespective of the germ found, an autogenous vaccine should be made from it and huge doses administered to the patient. The initial dose, as advised by Murray, is one hundred and thirty million dead bacteria, increasing gradually to as many as two billion at a single dose. The writer and others have not had the uniform success reported by Murray and feel that until more is known, autogenous vaccines must not be looked upon as a panacea.

In considering the treatment of constitutional diseases the writer must state that he does not believe that gout, rheumatism and like conditions are causes, *per se*, of pruritus ani; but since most of these are of intestinal origin, the patient should be put on a diet that will relieve intestinal conditions and will give the

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liver a chance to recuperate. Warning should be given to guard against intestinal toxemias of exogenous origin, and the toxemias due to shell-fish, strawberries, and other articles of diet irritating to this individual.

Should hypertrophied papillæ be found in the rectum the removal is indicated as described elsewhere (p. 245).

Inflammation of the crypts should be treated as detailed in Chapter XI. A moist eczema, due to a local discharge, will yield very readily to the proper treatment. Of course the origin of the discharge should be located and appropriately treated, and instruction given to keep the parts clean so that reinfection of the skin will not take place. The following lotion is advised, to be followed with a dusting powder of stearate of zinc.

R—Calamine . . . . gr. xl
    Zinc oxide . . . . ℥iij
    Liquor carbonis detergens . . . . gr. xx
    Glycerin . . . . ℥ss
    Aqua calcis . . . . ℥j
    Aqua . . . . q. s. ad ℥iv—M.
Sig.—Apply twice daily.

R—Ichthyol . . . . ℥ss
    Zinc oxide . . . . ℥ij
    Lanolin . . . . ℥ij
    Oleum olivæ,
    Aqua calcis . . . . āā ℥ss
Sig.—Apply night and morning.

Eczema marginatum is treated with a solution of hypophosphite of sodium, applied three or four times daily; also, at night, after the patient has taken a sitz bath. The clothes should be changed each day to prevent reinfection.

Oxyuris vermicularis requires general treatment in addition to local measures, owing to the fact that the natural habitat of these worms is in the cecum. Therefore any treatment which does not reach the cecum is worthless. Castor oil should be administered frequently and high injections of salt solution, or some medicated solution such as ichthyol or krameria, used. For the temporary relief of local lesions nothing surpasses a 2 per cent. solution of silver nitrate carefully painted over the parts once a day. It has been the writer's experience that this form of treatment has been more beneficial than any other.

If pin-worms are present, the patient is given high enemas of 1 to 1000 formaldehyde solution, together with catharsis; local treatment being instituted at the same time.

Aside from removing any lesions coincident with pruritus ani, the author finds the following course most proficient: if abrasions exist, they are treated with a solution of silver nitrate, 20 grains to the ounce, after the parts have been thoroughly cleansed. If the skin is macerated, the patient is instructed to use a powder of either plain starch, zinc oxide, calamine, zinc stearate and menthol; or stearate of zinc either alone or combined with ichthyol. Sometimes painting the skin of the entire affected area with a solution of silver nitrate, followed by some such powder as mentioned, will be sufficient to afford relief.

Painting the parts with tincture of iodine or with the following has proved beneficial in some cases:

```
R—Carbolic acid                                    ℥ij
    Salicylic acid                                 ℥j
    Glycerin      .      .      .                  ℥j—M.
Sig.—Apply to the parts with a camels' hair brush when itching is severe.
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R—Zinc oxide                                       5 grams
    Iodine   .                                     25 grams
    Glycerin      .      .                          50 grams—M.
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Equal parts of a solution of argyrol and ichthyol will occasionally be found useful.

Other formulæ are:

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R—Calomel      .                                        ℥j
    Carbolic acid                                       gr. iij
    Tar      .                                          ℥.ss
    Menthol                                             gr. xx
    Zinc oxide                                          ℥ij
    Lanolin      .      .                   q. s. ad    ℥ij—M.
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Matthews recommends:

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R—Campho-phenique      .                      .      .  ℥j
    Distilled water      .      .      .      .      .  ℥j
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This should be applied as a lotion after the use of hot water, and repeating as often as necessary. Adler suggests the following as worthy of trial:

R—Fluidextract of hamamelis . . . . ℥j
    Fluidextract of ergot . . . . ℥ij
    Fluidextract of hydrastis . . . . ℥j
    Compound tincture of benzoin . . . . . . ℥ij
    Carbolized olive or linseed oil,
    Carbolic acid (5 per cent.) . . . . āā ℥j—M.
Sig.—Shake well before using.

Allingham recommends the following:

R—Menthol . . . . ℥j
    Cocain hydrochloride . . . . gr. xx
    Alcohol,
    Distilled water . . . . āā ℥j—M.
Sig.—Apply locally.

R—Liquor carbonis detergens,
    Wright's glycerin . . . . āā ℥j—M.
Sig.—Apply locally.

The parts are to be painted with this once or twice a day. If the perianal tissues are very much thickened, the following will be found beneficial:

R—Liquor potassæ,
    Cade oil,
    Alcohol . . . . āā ℥j—M.

This is rubbed into the parts once a day, and followed by a soothing ointment, such as:

R—Unguentum zinci oxidi . . . . ℥j
    Chloroform . . . . ℥j—M.
Sig.—Apply freely to the parts, but allow the chloroform to evaporate before covering.

It may not be out of place to add that the National Formulary contains a sufficient number of remedies for use in pruritus. Sad to relate, however, drugs are often of little avail and we find ourselves compelled to turn to other channels to find methods of relief. Curetting the parts, the Pacquelin cautery, rectal plugs and dilatation of the sphincter have all been tried with indifferent success, though all at times give temporary relief.

The most satisfactory operation for the relief of pruritus ani, one that really affords relief, is in making a complete division of the sensory nerves supplying the affected area. Several

procedures have been devised, notably Ball's and Krause's. The author, however, believes the method detailed below, as devised by himself, has all the advantages and none of the disadvantages of the other operations. The entire operation is performed under local anesthesia, and in no way inconveniences the patient or

Fig. 105
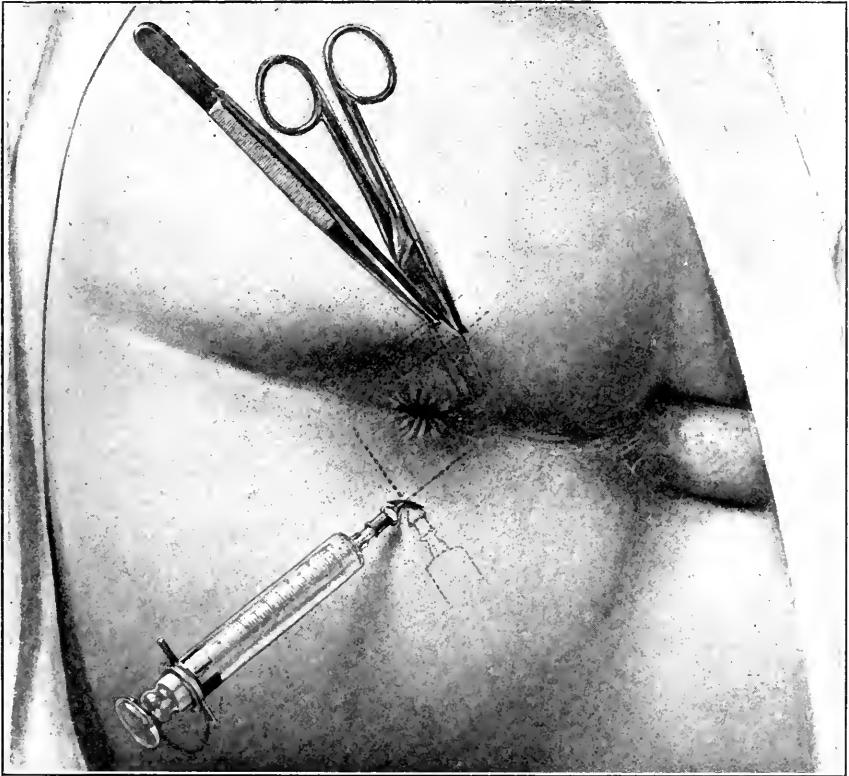
Lynch's operation for pruritus ani.

enforces confinement. It is not beset with possible complications as are the other procedures; there is a minimum amount of scar formation, and the direction of the scar makes stricture impossible; while the blood supply of the operated area is so little disturbed that the danger of sloughing is *nil*.

The patient is placed upon his left side, with knees and thighs flexed. A point is chosen about one and a quarter inches from the anus. At this point a 1 per cent. solution of novocain or a one-fifth of 1 per cent. solution of cocain is injected. More recently we have preferred a 2 per cent. solution of hemesia.

An area extending to the posterior midline is anesthetized. At the point above mentioned a small curved incision is made, about half an inch long, and extending just through the skin. Through this incision a blunt-pointed dissecting scissors, curved on the flat, is introduced as in Fig. 105. With this instrument a blunt subcutaneous dissection is now carried out, working to the anus mesially and to the raphés anteriorly and posteriorly. When completed, there is an area of skin, extending from the anterior raphé to the posterior commissure and involving all the skin within a radius of one and a half inches from the anus, which has been deprived of its sensory nerves. Any bleeding may be controlled by pressure. When the bleeding has stopped, a small piece of rubber tissue is introduced into the incision and permitted to remain twelve to twenty-four hours. Sometimes, in addition, a horsehair stitch is taken through the incision, but this is not usually necessary. As a rule, at the end of forty-eight hours the wound is entirely healed. Either at the same sitting, or at some subsequent time, the same procedure is followed on the other side. The results of this operation have always been satisfactory. Though there may be a recurrence, this is not likely to take place for two or three years, and two or three years of relief to a patient is often a great boon. The itching, of course, ceases immediately, and perianal sensation being lost, the irritation soon lessens. With proper treatment all local conditions should promptly clear up.

The writer employs this operation only after all medicinal means have failed; but believes that it is the most certain means of all to insure relief from this aggravating condition.

CHAPTER XI.

CRYPTITIS AND PAPILLITIS.

THE anal mucous membrane, at its termination in the neighborhood of the internal sphincter, is thrown into a number of longitudinal folds. This has a two-fold object—first, to accommodate itself to the narrow anal canal when contracted, and, second, to allow of the dilatation of the anus without undue stretching of the mucous membrane. Between each series of folds is a depression which dips down and terminates in a little pocket. These pockets are known as the crypts of Morgagni, and form a sort of semilunar valve between each column.

Between each semilunar valve is a little tactile body known as a papilla. The semilunar valves are supposed by some to secrete mucus to lubricate the anus. Occasionally, foreign bodies or little particles of fecal matter find their way into these pockets and ulceration results. This ulceration may or may not terminate in abscess formation; if it does, it will usually result in a fistula. The ulceration may be very slight, yet sufficient to cause considerable disturbance.

The columns of Morgagni are well adapted for the protection of bloodvessels. These columns contain a vein and an artery. The vein very often becomes varicose, producing hemorrhoids. On account of this varicosity the semilunar valves are held open, and, under these circumstances, are more apt to become inflamed or torn. As a result of congestion the papillæ enlarge, and occasionally one sees, in connection with a hemorrhoid, a sacculated valve and a very much enlarged papilla. These papillæ sometimes reach relatively enormous proportions. The author has seen them as large as the end of the thumb, and in such cases they are true fibroid tumors.

CRYPTITIS.

Pain is perhaps the most reliable symptom of cryptitis. It is usually dull and aching in character, and is constantly before the mind of the patient. Occasionally it is a sharp, shooting pain;

Fig. 106

Cryptitis and papillitis.   (Lynch.)

throbbing, when an abscess begins to form. It is increased during defecation, and to those not familiar with the disease it is very often mistaken for a neuralgic pain. It can be readily understood

how this happens, for, on examination with the proctoscope (the passage of which, by the way, usually causes severe pain), no definite lesion can be discovered. It is usually worse after violent exercise, and aggravated by occupations which require

Fig. 107

Section of the rectum and anus showing crypts and columns of Morgagni.
(Piersol.)

the individual to stand for a long time. It is sometimes greatly relieved by pressure, and for that reason the patient will very often tell you that he can get some measure of relief by pressing up the perineum. At times the pain is acute and agonizing

especially during defecation, and these patients, as in the case of fissure, become constipated because of the fear of the pain which attends defecation. Occasionally, in males, the pain is referred to the prostate, and these cases, as also in the case of fissure, are treated for prostatic diseases until by some accident the cause of the trouble is located in the rectum.

A case is reported by Vance where a patient suffered from spasm of the sphincter, a bearing-down pain and constipation without any apparent cause. For this pain the sphincter had been frequently stretched, and it was finally looked upon as a case of neuralgia until Vance, by chance, put a probe into the pocket and discovered the cause of the trouble.

Spasmodic sphincter, like the two previous symptoms, is nearly always present under these conditions. It is looked upon by old writers as a neurosis, and Goodell described it as an insane rectum.

In 1909 Dr. Beach, of Pittsburgh, in a paper on Pruritus Ani read before the American Proctologic Society, suggested that a majority of cases of itching of the anus were due to a subcutaneous fistula resulting from cryptitis. There is no question but that, in many cases, this is a primary cause of itching, but in our opinion it is usually started by some other lesion.

Symptoms.—Painful urination, on account of spasm of the neck of the bladder, is occasionally due to cryptitis. Other reflex disturbances that may be mentioned are dysmenorrhea, amenorrhea, dysuria, mucous urethritis, spasm of the sphincter or levator ani, and neuralgia of the testicles and perineum.

Tuttle mentions cardiac palpitation as a reflex disturbance. He goes so far as to assert that some stomachic conditions may be due to this disease. Of course we can understand why pain in any region of the body, if severe enough, may cause reflex disturbances that may manifest themselves in almost any other part of the body, so that one may, without exaggeration, if no other cause can be found, ascribe to this neuralgic condition remote reflex disturbances.

Diagnosis.—The diagnosis of cryptitis is made from the symptoms and by directly investigating the condition of the crypts. This is done in the following manner:

A Humphreys speculum, or any one of a number of specula

with a window on one side, having been passed in, a probe, bent
upon itself, is inserted into the rectum and each crypt investi-
gated. This probe should be of very fine silver and offer no
resistance to the tissues. It should be remembered that it is a
comparatively simple matter to pass an ordinary probe into a

Fig. 108
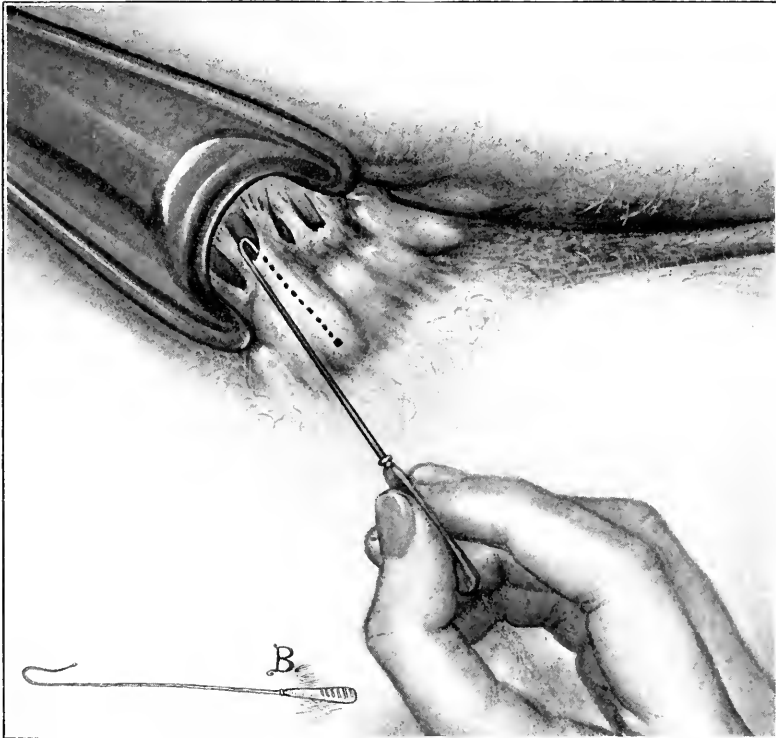
Exposure of the anal canal through Humphreys' speculum; shepherd's crook
probe introduced into cryptic pocket leading down into hypertrophied radial fold.
B, shepherd's crook flexible probe. (Tuttle.)

crypt and through a crypt without using considerable force. It
should also be borne in mind that this is not necessary in order to
demonstrate the presence of an ulcer or fistula in a crypt. If the
crypt is inflamed the patient will experience severe pain the
moment the probe is inserted. This pain somewhat resembles
the pain caused by putting a probe on the exposed nerve of a

tooth. Great gentleness should be exercised in making this examination as injury to the tissues may result in great harm by inducing other complications.
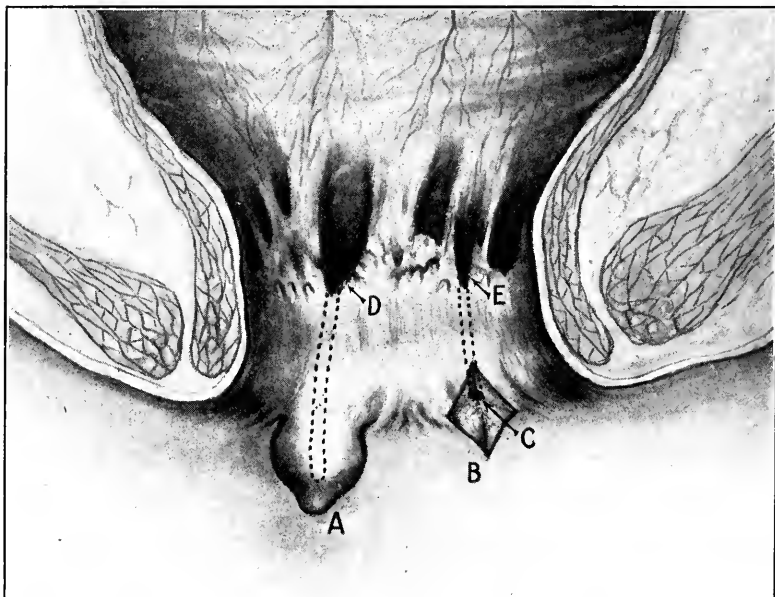
A–D, cryptic tract running down into skin tabs; *B,* wound from which skin tab has been clipped off; *C–E,* part of cryptic tract unopened by clipping off skin tabs, thus leaving a subcutaneous fistula which constantly infects the wound from which the skin tabs has been taken off, and thus prevents its healing. (Tuttle.)

Treatment.—If cryptitis is recognized in the early stages it is possible to cure the condition without operation. The crypt, having been discovered, a speculum with a window on one side is passed into the rectum, the window being passed in the line of the inflamed crypt. After the speculum has been inserted, the window is opened, and the speculum arranged until the crypt comes directly into the open window. If such a speculum as we have described above is not electrically lighted, an ordinary headlight, or some other form of reflected light, may be sufficient to illuminate the field. A bent probe, such as Fig. 108 *B,* is dipped into pure ichthyol and passed in through the speculum until the

crypt is reached. With great care the probe containing ichthyol is then passed into the crypt, and in this manner the ichthyol is applied directly to the ulcerated area. This process is continued daily until all pain has disappeared, and this can best be demonstrated by passing an ordinary probe, bent as above described, and thus testing the crypt.

The surgical treatment of cryptitis can be carried out under local or general anesthesia. If local anesthesia is used, the method of anesthetizing the sphincter as already described in another chapter (see p. 46), is to be followed in detail. After this has been done, a Humphreys speculum is passed into the rectum, either anteriorly or posteriorly, depending on the location of the diseased crypt. This instrument is then held in place by an assistant. The crypt to be operated on is infiltrated with cocain; after it has been thoroughly cocainized, a bent probe is passed into the crypt and the valve put on tension, as in Fig. 108. Then, with the scissors curved on the flap, the entire valve is removed, the sphincter muscle gently stretched, and a little piece of iodoform gauze placed on the raw surface.

A Lynch tube may or may not be inserted. If the tube is used, it should be removed at the end of forty-eight hours, and the gauze allowed to remain in place until after the bowels have moved. The bowels having moved, by the aid of a 2 per cent. hydrogen peroxide enema, the patient receives half an ounce of castor oil or laxol. The after-treatment consists in making daily applications to the raw surface for the first week; at the end of this time the patient is instructed to come every other day, when the same proceducurring ried on until the raw surface is entirely healed. Before making an examiso by ta Humphreys speculum should be passed in in order to stretch the muscle.

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PAPILLITIS.

Inflammation of the² it. or papillæ, while not an accompaniment of cryptitis, is often tound associated with it. On the other hand, papillæ are frequently enlarged and attain considerable size without any associated cryptitis. We see this condition

associated occasionally with proctitis or simple congestion of the anus; also with hemorrhoids.

Symptoms.—The most constant symptom of papillitis is a tickling sensation, or a feeling as though the patient were passing worms. The real cause of the trouble is overlooked in a majority of cases, even though the patient describes the sensations accurately. The feces are examined; very often the anus is examined; and no evidence of worms is found. Medication may be instituted on the supposition that pin-worms are present; but after this treatment has been continued for some time, and the symptoms have not been relieved, the patient is looked upon as a neurotic. Pain is not a constant symptom of papillitis; but when present it is of a dull, dragging character.

Treatment.—The treatment of this condition is always surgical. The papillæ, either one or more, can be removed under local anesthesia unless the patient is an exceedingly sensitive individual, or has a funnel-shaped anus which makes the approach difficult. A little carbolic acid on the end of the probe is placed where the needle is to be inserted; this both sterilizes and anesthetizes the area. The needle is passed through the base of the papilla, and ten to twelve drops of the solution are injected. After this the papilla is seized with artery forceps and brought down into view. Now, any one of a number of procedures may be followed. The papilla may be crushed at the base by a very strong artery forceps or an appendix clamp and allowed to slough off or come away of its own accord, which it generally does at the end of three or four days; or a silk ligature may be thrown around the base of the bognized and tied at this point; afterward the cure th can be cut off or allowed to slough away.

The patient is then treated as described in the case of cryptitis until he is perfectly well.

ectrical

STRICTURE is a cicatricial contraction resulting from an ulceration; an infection eventuating in a diminution of the caliber of the bowel and ending in intestinal obstruction if not relieved. This contraction, when it occurs in the rectum, is generally situated from 3 to $3\frac{1}{2}$ inches from the anus. It affects females more frequently than males, and is of such gradual onset that cognizance of its presence is rarely taken by the patient until stricture is well established.

Etiology.—For the sake of convenience we will put strictures under three heads, congenital, spasmodic, and inflammatory. There is no good reason for further subdividing them according to shape.

Congenital Strictures.—Owing to some congenital malformation or an imperfect blending, a narrowing of the gut may result. It is fair to assume, however, that in the majority of cases this trouble is discovered at an early period and relieved at that time by surgical measures. It is quite possible, though, the writer having seen one case, for a partial septum to exist between the anus and the rectum. These strictures can be distinguished from those occurring late in life by the history of constipation existing from childhood, and also by the fact that the bowel, both above and below the mucous membrane, is healthy. Still, this may not always follow, because a congenital obstruction may result in ulceration above the stricture. In this way, too, it differs from other strictures, as the ulceration or fistula, if one exists, is more likely to· manifest itself below the stricture than above it.

It is well, at the onset, to explain why ulceration occurs below rather than above a stricture, and it would seem that the only logical explanation lies in the fact that the blood supply to the

rectum is, in a sense, a terminal blood supply, so that when an inflammatory process constricts a portion of the bowel, the circulation below the stricture is shut off, entirely or partially resulting in a necrosis or ulceration. This condition does not prevail in congenital stricture. A congenital stricture may, however, result in an inflammatory stricture as the result of ulceration and inflammation, so that we may have an inflammatory stricture that was primarily congenital, thus making it difficult, in some cases, to distinguish between these two forms.

Spasmodic Stricture.—Under this heading has been described by several authors, notably Cripps, a form of stricture which results from a chronic spasm of the intestine. The writer has never seen an undoubted instance of spasmodic stricture. It is difficult to understand why a spasmodic condition should result in a prominent fibrosis, except as the result of an infection. It may be that those cases which have been described as spasmodic stricture resulted in this manner. The following sequence of events may have taken place: first, a spasm as the result of congestion; then an accumulation of fecal matter; ulcers; and subsequently infection with a resultant stricture. If such a condition exists, it must be treated along the same lines as an ordinary inflammatory stricture, and the treatment of this condition will be described later on under the general heading, Treatment of Stricture (see page 238).

Inflammatory Stricture.—Under this heading will be described all other forms of stricture, whether simple, tuberculous, syphilitic, neoplastic, dysenteric or traumatic. Until very recently the majority of strictures were supposed to be of syphilitic origin, but this is now denied by many able clinicians. No doubt, from now on, with the facilities afforded us by the Wassermann reaction, we will be able to say definitely if a stricture is inflammatory or syphilitic. The writer has under his care at the present time eleven cases of stricture of the rectum; of these, seven have given a positive Wassermann reaction. Of course, it is impossible to draw any conclusion from so few cases, but at the same time it is very significant. The question has never been definitely settled as to how syphilis produces stricture. Whether it is the result of a direct infection from a chancroidal

lesion or an interstitial hyperplasia ending in degeneration and contraction, it is difficult to say. We do have a fibrosis in other parts of the body as the result of syphilis, such as occurs in the spinal cord, resulting in tabes dorsalis. Under such circumstances it is probably due to an obliterating endarteritis, with gradual diminution of the blood supply with resultant fibrosis. As a matter of fact, a syphilitic stricture is just as much inflammatory as an infection from any other cause. It is somewhat analogous in many respects to the so-called hyperplastic tuberculosis. We have an infection which, in the majority of cases, causes a proliferation rather than a destruction of the tissues. We see this, for instance, in gummatous tumors. Therefore we believe, with Fournier, that stricture can result directly from a syphilitic infection. There is no question but that we may have a mixed infection; because, as happens in any other condition, no matter what the original cause, once we have an ulceration, we are bound to have a mixed infection, so that it is really a difficult matter to decide which organism plays the most important part in the subsequent fibrosis.

Neoplastic Stricture.—The only excuse for mentioning neoplastic stricture is that there are certain neoplasms which so closely resemble a true stricture that a chapter on this subject would hardly be complete without some reference to this form of occlusion. A neoplasm may occlude the rectum, either from without or from within. A large lipoma, which is not a malignant condition, may cause an occlusion of the intestinal tract. The writer has seen one case of this kind where a lipoma, by pressure, almost entirely occluded the ᵥₑᵢₙ ₐ . A malignant tumor opening into the lumen of the gut may occlude it by growing into it, or as the result of an inflammatory process outside. This is particularly true in ulcerating carcinoma, where an occlusion is more the result of an inflammatory process than the outgrowth of the tumor tissues.

A sarcoma sometimes resembles a perirectal inflammatory stricture, and it is almost impossible, except by histological examination, to distinguish between the two. The writer has in mind one case where an enormous mass almost filled the entire pelvis, and at the same time so narrowed the lumen of the

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gut that the patient was in imminent danger of obstruction. This tumor had all the characteristics of a malignant growth, and while we do not approve of taking sections in order to establish a diagnosis histologically, it was impossible to decide, in this case, whether it was inflammatory or neoplastic without a histological examination. Accordingly, a wedge-shaped portion of the tissue was removed, and on examination proved to be benign. The tumor was evidently due to a prostatic abscess which ruptured into the superior pelvirectal space. Coincidently with this, the patient developed amebic dysentery, so that it was quite impossible to say which process was the most prominent etiological factor in the formation of this stricture. The symptoms in neoplastic strictures are somewhat similar to those in ordinary inflammatory strictures. However, the symptoms, differential diagnosis, and treatment are considered in the chapter on neoplasms.

Tuberculous Stricture.—It is now admitted by the majority of observers that tuberculosis does play a part in the formation of stricture. The only question to be definitely settled is the percentage of cases in which this occurs. By histological examinations, Tuttle, Mitchell, Hartmann, Toupet, Sourdille and others have demonstrated that tuberculosis may result in the formation of a true fibrous stricture of the rectum without the ulcers having healed. Sourdille collected eight cases, and gave it as his opinion that tuberculosis is an etiological factor in one-third of all cases of stricture.

It is a well-known fact that the tubercle bacilli are frequently found in the std_strictudividuals not necessarily suffering from tuberculosis; also, that if the vitality of the tissue is lowered, the tubercle bacilli will find a resting place, even though other microörganisms are the primary cause of the trouble. It is possible in tuberculous abscesses to find tubercle bacilli in pure cultures, but once the abscess is open, a mixed infection results. On the other hand, a colon bacillus around the rectum in tuberculous subjects may subsequently become infected with the tubercle bacilli, but in neither case would we be correct in assuming that the secondary infection is the primary cause.

It is a well-established fact that the hydrochloric acid of the

gastric juice destroys most bacteria, and, as shown by Cushing, the stomach is practically sterile after a meal; this applies, of course, to healthy individuals, but in those who suffer from pulmonary tuberculosis, and who are constantly swallowing the tubercle bacilli, the gastric juice must obviously allow a certain number of bacteria to escape. As a rule, tuberculous subjects do not have a good digestive apparatus, and the intestinal canal of such individuals contains numerous tubercle bacilli. This accounts for the fact that about 50 per cent. of cases of pulmonary tuberculosis have a secondary infection of the bowel.

On the other hand, primary tuberculosis of the bowel is exceedingly rare. Usually, cases of tuberculosis of the bowel have a focus in some other part of the body. This being true, it does not seem possible that a patient with a primary tuberculosis, on which a bowel tuberculosis is superimposed, can live long enough to reach the stricture stage. That stricture of the rectum results occasionally from tuberculosis must be admitted by all. That tuberculosis localized in the anus results in stricture is not to be denied; but we cannot agree with Sourdille that tuberculosis is an etiological factor in one-third of the cases. That there are, however, benign forms of tuberculosis we do not dispute, and it is quite possible that this form of tuberculosis is more often the cause of stricture than the active or ulcerative forms. It may be that this form of tuberculosis is somewhat akin to the so-called tuberculide of the skin, and that a similar process takes place in the bowel that takes place in the skin, namely, a proliferation of tissue with subsequent contraction. Of course, a tuberculide of the skin is not accepted by all as being a true tuberculous process.

There is a form of tuberculosis which has recently attracted attention. It is supposed to be due to an attenuated tuberculous infection, and differs from more virulent forms of tuberculosis in that the destruction of tissue is trifling, while cell proliferation is excessive. In this condition the entire wall of the bowel, together with the peritoneum, is involved in the process. When localized, the lesions are generally found in the cecum, appendix, sigmoid and rectum.

This form of tuberculosis is frequently mistaken for carcinoma

or diverticulitis, and sometimes for sarcoma. If the infection involves the peritoneal coat the omentum is generally adherent, and there are adhesions between the small intestine, omentum and the organs involved. Sometimes the mass is so large that it can be felt through the abdominal wall. The etiological factors, according to Adami, are as follows: "Extensive hyperplasia of the connective tissue in which typical tubercles are scanty or even absent. Caseation is rarely extensive, and the specific bacilli may be hard to demonstrate. A striking feature in some cases is a hyaline degeneration of the exudate and of the newly formed connective-tissue fibrils."

In one case seen by the writer a diagnosis of carcinoma was made, and it was only after a histological examination that the real cause of the trouble was discovered.

Gonorrheal Stricture.—According to continental writers, gonorrhea is an important etiological factor in the causation of stricture. Among those who support this theory are Neuberger, Forster, Volkmann, Schuckardt, Ponfick, Delbet, Huber and Berndt. The experience of the writer, however, has not led him to believe that gonorrhea is ever the direct cause of stricture. Many cases of gonorrheal proctitis have come under his observation within the last ten years, and in none of the cases was the inflammation very severe. Although many cases which were observed were undoubtedly cases of gonorrheal proctitis, only those are considered in which the gonococci were recovered from the rectal secretions. The inflammation was not severe in any of these cases, and in several it was limited to an area $2\frac{1}{2}$ to 3 inches from the anus; all rapidly recovered under very simple treatment. So far as our observations go, we do not believe that the gonococci thrive very readily on the rectal mucous membrane. If stricture results from a gonorrheal proctitis it is due, we believe, not to the virulence of the gonococci but to the streptococci; or, as we have mentioned in another part of this chapter, to the various bacteria which inhabit the intestinal tract.

A careful review of the literature on this subject is sufficient to confirm us in this belief. Huber is of the opinion that subacute and very often acute rectal gonorrhea does not produce subjective

complaints, and is in most cases accompanied by very few symptoms. He says that the ulcer may be due, not to the gonococci but to a secondary infection. In the only case in which the gonococci were found in the granular and perigranular tissues and in the deeper tissues of the mucous membrane, tubercles were also found, for which reason that case must be considered questionable.

Stricture Due to Other Causes.—Polchen states that vulvovaginal abscesses play an important role in the causation of stricture, inasmuch as a path is open to the colon, and an infection of the perirectal tissues may thus be induced.

Reber believes that gynecological operations very often result in stricture because of some nutritional disturbance, such as stretching or closing the superior hemorrhoidal artery; and our experience entirely accords with that of Reber. We have seen five strictures resulting from gynecological operations, especially where the vaginal route has been followed, and this can be accounted for in a great measure by the cutting down of the circulation, or perhaps a thrombosis of some branch of the inferior or middle hemorrhoidal arteries. It does seem that nutritional disturbance must play an important part in the pathology of stricture.

Cicatricial stricture has resulted from the introduction of foreign bodies into the rectum. Such cases have been reported by Kelsey, Bismark and others. An accidental introduction of caustics into the rectum, such as nitrate of silver or chloride of zinc, has resulted in cases of stricture. Tuttle reports a case of this kind.

We have frequently seen stricture follow a resection of the rectum. In fact, we might say that in every case where the rectum has been resected, and an end-to-end anastomosis made, stricture has resulted. Why it should occur here and not in the bowel covered by the peritoneum we are not prepared to say, but it is a fact, nevertheless. It may be due to an inadequate blood supply following operation.

It is stated by some writers that both the amebic and bacillary forms of dysentery are important factors in rectal and colonic strictures. The writer has seen and treated over 100 cases of

amebic dysentery but has never seen a single stricture that could be traced to this source. Two cases which came under our observation gave a history of dysentery during childhood, but whether this was a true dysentery or some other infection, it is hard to say. There is no reason why stricture should not result from amebic dysentery, but our experience is not in line with that of others.

Inflammations outside of the bowel are likely to end in stricture. One case of the writer's could be traced to a perisigmoiditis; another was due to diverticulitis. Both cases were operated on, so there was no question as to the origin of the trouble. Another case that came under our care could be traced to a vaginal hysterectomy. In this case the bowel must have been injured at the time of operation and the prolonged drainage, with subsequent injury by packing, undoubtedly caused the stricture.

Displacements of the uterus, inflammation of the tubes and ovaries, and injuries incident to childbirth, must be considered as etiological factors in the causation of stricture.

Simple inflammation is perhaps a more important etiological factor than all of the other conditions we have mentioned. The common term, simple inflammation, however, is a misnomer, because an inflammation that will result in stricture is anything but simple; then, again, all strictures are of inflammatory origin, because a stricture cannot result without a previous inflammation. We see no great advantage in dividing and subdividing strictures based on bacteriological findings, since with our present knowledge it is impossible to say definitely that this or that organism is a cause of stricture.

It has never been definitely settled which bacterium plays the most important part in the formation of stricture, and it seems strange that stricture does not result more frequently when one considers the severe infections to which the rectum and colon are subject. The writer has never seen a case of stricture result from an amebic infection; although one might imagine that this infection would be more likely than any other to cause stricture. In the first place, it is usually a very severe infection, and the amebæ carry with them into the deeper tissues the bacteria with which they are associated, and by which their

existence is made possible. The same may be said of those very acute and hemorrhagic infections that involve the entire thickness of the bowel, together with the peritoneum and pericolonic fat. The writer has been able to observe several cases of this kind, and stricture has not resulted. Again, we have severe infections resulting in multiple polyposis, and have followed some of these cases for five years without seeing a stricture result. Innumerable instances of this kind might be mentioned in order to establish the fact that severe infections do not always result in fibrous contractions of the bowel.

What conditions, then, are necessary to cause a stricture? This is a difficult question to answer. It seems to the writer that there must be some specific bacterium which comes into intimate contact with the cells and results in a general fibrosis.

Symptoms.—Gradually increasing rculous, and will probably be the first symptom to attract the patient's attention. Cathartics give relief at first, but soon fail to produce the desired effect, and the patient resorts to enemas. As the constipation increases, colicky pains become frequent, followed by periods of diarrhea, the diarrhea alternating with constipation. After a while, the desire to move the bowels becomes frequent and imperative, followed by a discharge of mucus and pus. This is due to the ulcery from below the stricture and the increased output of mucus. A little mucus mixed with pus gradually finds its way into the rectum and causes an intense desire to move the bowels. One of the most distressing symptoms is the desire to move the bowels, when a little mucus, blood and plasi may be passed, followed by a feeling aptly described by Tuttle as one of "unfinished business." If the stricture is situated in the sigmoid, the pain is referred to a point on either side of the sacral vertebra, just at its juncture with the last lumbar vertebra. This is due to the strictured portion of the sigmoid becoming invaginated in the rectum, when, as a result of pulling on the mesentery, the pain is produced. In all cases where the mesosigmoid is pulled on, the pain is referred to these two points. If the stricture is situated in the rectum, the same condition may exist as during straining; in an effort to discharge the feces, the mesosigmoid is pulled on. In addition, the patient experiences pain over the

sacrum, and perhaps pain in the hips and down the legs, as a result of the accumulation of fecal matter in the rectum. Frequent urination is often associated with the condition because of the pull exerted on the peritoneum as it passes from the bladder to the rectum. The impression seems to prevail that tape-like stools are strongly presumptive evidence of stricture. This is not so in the majority of cases, as the stools are formed by passing through the anus. If, however, the stricture is low down in the rectum, the strictured portion of the bowel may be forced down to the anus and in such a case the stools will be narrow or ribbon-like. This condition may also prevail where there is no stricture, but simply an intussusception of the sigmoid, or where a fissure exists, causing spasm of the sphincter. Or, again, a simple spasm of the muscle where no lesion exists may cause these ribbon-like stools.   king, undoub   .

Pathology.—The microscopical appearance in the early stages, particularly in the two cases where we were able to follow the patient from the prestricture stage, showed that the first intimation was ulceration with a mucopurulent discharge covering the entire rectum. Later on, blood was mixed with rolled and con As the inflammation progressed large patches of ulceration could be easily distinguished; this cleared up somewhat under treatment. For three or four inches, the rectum was entirely denuded of mucous membrane, and its place taken by granulation tissue.

One of the earliest manifestations is a round-cell infiltration, more marked, perhaps, in one place than in another, so that it may well be mistaken for a solitary follicle. The glands at first are gradually pushed apart and finally distorted and obliterated. Numerous eosinophile cells can be seen with an increase of the interstitial tissue which separates the glands. The epithelium lining the glands is observed with difficulty on account of the cloudy swelling, so that the cells appear to merge one into the other, the cement substance having disappeared and also the nucleus. There is an increase in the number of goblet cells and the lumen of the gland becomes filled with mucus, giving the impression of hypersecretion. At this stage a faint outline of the nucleus may be present or it may be entirely absent. A

proliferation of the fixed connective cells in the submucosa takes place as a result of the infection and inflammation with a round-cell infiltration. This round-cell infiltration pushes up and destroys the muscularis mucosa so that in places it is entirely obliterated. The submucosa becomes very much thickened by a development of adult inflammatory fibrous tissue with round-cell infiltration. The inflammation then extends to the muscular coat and here the fibrous tissue between the individual muscle bundles becomes involved, resulting in destruction of the muscle with increase of the connective tissue and isolation in some places of muscular bundles. If in the sigmoid or rectosigmoidal juncture the peritoneum is involved in the inflammatory process it becomes thickened.

It is difficult to distinguish clinically, and sometimes histologically, between syphilitic, tuberculous, and inflammatory stricture. Histologically, in the syphilitic stricture, we should find an obliterating arteritis with thickening of the intima; also giant cells and the plasma cells of Unna. To be sure, we find an endarteritis in tuberculous and inflammatory strictures, but the arteries are not so thickened in either of the above-mentioned conditions, nor are they obliterated as in syphilis.

Giant cells are found in the tuberculous variety; but they differ materially from those found in syphilis. In the giant cells of syphilis the nuclei are distributed all around the periphery, while in the giant cells of a tuberculous lesion the nuclei, while also distributed at the periphery, are in the shape of a horseshoe and do not embrace the entire circumference. The plasma cells of Unna are characteristic of syphilis and differ from the ordinary plasma cells in that the cytoplasm of the cell as well as the nuclei is stained by the eosin. It is not always well to make a diagnosis of tuberculosis on the giant cells alone, especially in a region where foreign substances abound, and where there is a tendency to the formation of giant cells. On this account it would seem as though the tubercle bacilli should be demonstrated before a positive diagnosis of tuberculosis is made.

Notwithstanding the distinctions we have made, it is sometimes impossible to distinguish microscopically between inflammatory, syphilitic and tuberculous stricture, because they sometimes show

the same histological structure. Delbet denies the perivascular and endovascular infiltration, which so many authorities accept as characteristic of lues. Tieder finds that in early stages the arteries are not affected but that the veins are very much diseased; and he found gummata and round-cell infiltration in all the layers of the intestines.

From the early stages the vascular changes are almost always limited to the veins. In a well-developed case Tieder found almost the same changes, except that the connective tissue was more developed. The mucous membrane was almost entirely absent, and the submucosa appeared like a delicate layer of connective tissue. The only way to demonstrate the vessels in the regions thus attacked is by staining the elastic fibers. Also, in those cases, the arteries are almost normal, whereas the lesion in the veins is well developed and may extend into the perirectal tissues.

We have had several specimens examined and the report of Specimen No. 891 is more or less typical. We are indebted to Dr. J. E. Welch for histological data.

Macroscopic Appearance.—Specimen consists of a piece of large intestine measuring 15 cm. in length. The lumen is narrowed throughout, and the lower $9\frac{1}{2}$ cm. shows a stricture through which the opening is 6 mm. A segment of the bowel 6 cm. long, beginning 2 cm. above the lower end, is open, exposing the mucous membrane, which, in this situation, has a leather-like appearance.

Microscopic Examination.—Section 891, made from the upper end of the intestine, shows hypertrophy of the muscular coats and slight thickening of the peritoneal coat, which indicates a hyperplasia of dense inflammatory fibrous tissue, quite cellular in places and infiltrated by an exudate of leukocytes. The submucous tissue is very much thickened by a development of adult inflammatory fibrous tissue. Through this tissue are foci of small round-cell infiltration among which are numerous plasma cells. There are numerous bloodvessels present, some of the larger of which show thickening of their walls and a hyaline transformation of the muscular coat. There is more or less infiltration, throughout, by an exudate of leukocytes. The muscularis mucosa is replaced in places by foci of lymphoid accumulations

and shows considerable cloudy swelling. The mucous membrane is intact, but shows in places an increase in the interstitial tissue which separates the glands. The interstitial tissue is extensively infiltrated by an exudate of leukocytes and serum. The epithelium of the glands and surface is intact. There are numerous goblet cells present which gives the glands an appearance of being in a condition of hypersecretion.

Section 891a, made through the opened part of the bowel where the mucous membrane has a leather-like appearance, shows from within out as follows:

There is extensive desquamation of the superficial epithelium, leaving exposed to the surface an extensive area of granulation tissue rich in bloodvessels and infiltrated by an exudate of (We are no and serum. The fibrous element of this granulation tissue is continuous with the interstitial tissue of the glandular layer. Between the glands it has accumulated in such great quantities as to have caused pressure atrophy of the glands. These strictures are much fewer in number than in the normal mucous membrane and are absent altogether over considerable areas. The remaining glands are wider and shorter than normal. They contain very few goblet cells and show extensive desquamation of their epithelium. Beneath this altered mucous membrane layer is a very thick coat of dense inflammatory fibrous tissue, rich in small round cells and fibroblasts and permeated by an exudate of leukocytes. There are numerous bloodvessels in this tissue which have thickened hyaline walls. The internal muscular coat is hypertrophied and infiltrated by more or less adult inflammatory fibrous tissue, with here and there foci of round cells. The external muscular coat is thinner than normal; its muscular bundles are separated by accumulations of round cells and an exudate of leukocytes.

Section 891b, made through the anal margin, including the skin, shows everywhere a very dense adult fibrous tissue through which are scattered numerous muscular fibers which show cloudy swelling. There are large accumulations of lymphoid tissue which appear as independent foci and are arranged about some of the vessels. There are numerous bloodvessels with well-formed walls throughout this region, some of which show extensive thickening

of their walls. In some parts there is also an exudate of leuko-
cytes and serum, and small hemorrhages.

Diagnosis.—Stricture of the colon, sigmoid and rectum.

Remarks.—There is no special feature appearing in the examina-
tion of the histological sections of this specimen to indicate
any special or specific etiological factor. The process appears
to be a simple inflammatory hyperplasia.

Diagnosis.—The diagnosis of stricture is a comparatively
simple matter in the majority of cases, because the lesion com-
monly occurs within the first two or three inches of the canal
and, after a digital examination, no difficulty should be experi-
enced in discovering that the patient has a narrowing of the
intestine. Of course, it is easily understood that one who is not
accustomed to making these examinations might nion in the
stricture for some other condition; but if he arrives at the con-
clusion that the patient has a pathological condition and directs
him to someone who is more familiar with such conditions he
will then have done his duty, as it will be a simple matter for
the experienced man to determine whether this pathological
condition is or is not of serious importance. We have in mind,
just now, some other conditions that may be mistaken for stricture
and which we shall discuss later on, but if the stenosis is dis-
covered when the patient is first seen by the family physician,
there is every probability that relief can be obtained; at least
the patient is given the best chance for his life in this event.

This history is very important in directing the attention of
the physician to the presence of stricture. Gradually increasing
constipation is always a symptom that requires a rigid examina-
tion. It does not follow that if a patient complains of gradual
constipation he is necessarily suffering from stricture; but a his-
tory of constipation coming on in a previously healthy person
is always suggestive of some pathological disturbance. If this
history is preceded by one of acute diarrhea it is still more sug-
gestive. If, after the constipation has developed, the patient
gives a further history of colicky pains following a movement
of the bowel, especially if he has to strain, and after a movement
relief from the colic is obtained, we have another link in the
chain. Then, if added to this, we get a history of the passage of

mucus, with or without blood, the patient has to go to the toilet frequently, and has a feeling as if there were something more to come away all the time, one may confidently make a diagnosis of stricture. That this is always a benign condition is not a fact; but it is conclusive that there is a narrowing of the bowel. Of course, all cases do not give the same history; that is, the group of symptoms we have described may not all be present, though they are in the majority of cases. If not enough of these symptoms are present to form a conclusion a digital or, still better, a procto-scopic examination will reveal the cause. When the stricture is lower down a history of growths around the rectum called by the French *rhagades*, also a history of hemorrhoids, taken with the previous history, would suggest stricture of the rectum. (We are now speaking of stricture in the broad sense of the word and not referring to stricture from an etiological stand-point.)

Now that we have both the positive means of diagnosing syphilis by means of the Wassermann reaction, and the tuberculin tests for proving tuberculosis, all cases where either of these conditions is suspected should be subjected to proof. If, after applying these tests, the reaction is negative, we are able to exclude both syphilis and tuberculosis and will have gone a long way in the right direction toward placing the etiology of stricture on a sound basis.

Stricture of the rectum is very apt to be confounded with carcinoma and intussusception.

INTUSSUSCEPTION.	STRICTURE.	CARCINOMA
Periods of relief from symptoms.	Symptoms constant, duration extending over a number of years.	Symptoms constant, generally of short duration.
Loss of weight.	No loss of weight.	Loss of weight.
Periodic attacks of hemorrhage, after which the patient feels relieved. No pus.	Blood, mucus and pus; mucus constant.	Blood, mucus and pus constant; but of shorter duration.
Cachexia absent.	Cachexia absent.	Cachexia present.
Dragging pain in left iliac region, on either side of the lumbo-sacral joint, relieved by enemas.	May or may not be present.	May or may not be present; an uncomfortable feeling rather than actual pain in the early stage; pain referred all over the sacrum later on.
Digital examination reveals a soft projection resembling cervix.	Hard, smooth, induration.	A lump or mass.

Stricture.	Sarcoma.
Gradual onset.	Rapid onset.
Discharge of blood, mucus, and pus.	Rare in sarcoma.
No loss of weight.	Loss of weight.
Stricture of narrow caliber.	Large caliber.
Mucous membrane ulcerated.	Mucous membrane generally intact until very late in disease, and at this stage there is hardly any chance of mistaking sarcoma for stricture.

Complications.—Hemorrhoids are frequently associated with stricture, as they are with almost any condition where the return circulation is obstructed. For this reason in hemorrhoid cases a careful examination of the rectum and sigmoid should be made before any treatment is instituted. Fistula is a common complication of stricture, and is due to the ulceration. Abscess formation occurs also, and this is due to the same condition. Ulceration is always associated with stricture, and, as Tuttle has pointed out, is due to the shutting off of the circulation below the seat of the stricture. This simple problem as to why an ulceration exists below instead of above the stricture was previously unexplained.

Hernia, as would be expected from the straining associated with this disease, is an occasional complication. Skin tabs are often associated with stricture of the anus, but very rarely complicates stricture.

Great stress has been laid on the presence of these condylomata by French writers and are looked on as pathognomonic of syphilitic stricture. In our experience they occur occasionally, but are not by any means as common as the French writers would lead us to believe. We have seen them associated with tuberculous stricture of the anus and in a good many other conditions where stricture did not exist.

Fistula is perhaps the most frequent complication and is due, of course, to ulceration and subsequent infection.

Treatment.—The treatment of stricture will depend to a great extent on the location and the amount of bowel involvement. If, for instance, it is situated in the lower part of the rectum or anal canal and is of the annular type it can be easily corrected by gradual dilatation, or by some simple operative procedure.

On the other hand, no matter where it is situated, if it is of the tubular type and extends to the peritoneal reflection, nothing short of a colostomy, or radical operation, will be of any material benefit to the patient. All strictures of the so-called valvular, annular, and even tubular variety, if not over an inch to an inch and a half in length, can be relieved by gradual dilatation.

Gradual Dilatation.—This line of treatment, when properly carried out in suitable cases and in the hands of a careful man, gives very good results in the treatment of stricture—especially in the annular form, and also in the tubular variety, where the stricture does not extend over an inch or an inch and a half, and particularly when it is situated in the lower portion of the rectum. If the stricture is situated at the peritoneal reflection, this form of treatment is fraught with considerable risk, even in the hands of the most careful and competent men, as there is always danger of rupture. Besides, one cannot say with certainty how far this treatment may be pushed before the bowel gives way, and when it does rupture it is always in the long axis of the gut and is sure to involve the peritoneum.

Bougies.—If gradual dilatation is adopted and the stricture is not within reach of the finger, the bougie of Wales is perhaps the safest instrument, if there is such a thing as safety in these cases. These bougies range from No. 1 to Nos. 10 and 12. If the stricture is more than an inch and a half above the anus it is much safer to pass a proctoscope, first up to the stricture and then pass the bougie through the proctoscope, withdrawing the proctoscope when the bougie has engaged the stricture. By following this method the danger of passing the bougie into a sulcus at the side of the stricture is avoided; the damage resulting from the latter procedure being obvious. The bougies used for this purpose are devoid of collars. The dilatation should be begun with the smaller size bougie and if this passes easily a larger size can be introduced at the same sitting. For the first month, or five weeks, the stricture should be dilated about three times a week; after this, once a week will be sufficient. Of course, there are some cases where the surgeon must use his own judgment as to how often the bougie should be passed in order to get the best results, as some patients are more susceptible to pain than

others; or on account of the irritation caused by the dilatation it may be necessary to allow the bowel to rest a while before repeating the procedure. Following the dilatation with the bougie, it has been the author's custom to pass the proctoscope up to the stricture, and through it to introduce a tampon of lamb's wool saturated with one of the following solutions: ichthyol and glycerin, 10 per cent.; argyrol, 25 per cent. in ichthyol; enzymol, full strength. This tampon is allowed to remain in place until the following morning, provided it does not cause the patient unnecessary pain and inconvenience.

Illustrative Case. Mrs. M., suffered from stricture of the bowel and was treated by dilatation, and irrigation with various solutions. One day following the usual dilatation the bowel was irrigated with salt solution. During the irrigation the patient complained a great deal of colicky pain and distention of the abdomen. As the salt solution did not return an investigation was instituted when it was found that the bowel had ruptured anteriorly, and the salt solution had passed up into the abdominal cavity. The patient was in a state of profound shock, and it took some stimulation to get her in condition for the subsequent operation. Fortunately, the solution was a normal saline, otherwise serious results might have followed. After the operation and repair of the rent the patient made an uneventful recovery. This accident occurred in the practice of a colleague, and taught the writer a lesson that he will never forget. Since then we have never used any other solution than the normal saline.

Forcible Dilatation.—Various instruments have been devised for dilating strictures. We need only mention the dilator of Sims, and of Durham, and the Barnes bags, all of which have been suggested and used for this purpose. We cannot conceive of any circumstance which could demand the use of these instruments; they are positively dangerous and have no place in the surgical or medical treatment of stricture of the bowel.

Dietetic Treatment.—The diet in all cases should be non-irritating, easily digested, and leave very little residue. For this reason foods that add bulk to the feces, such as vegetables, especially those containing a large amount of cellulose, are to be avoided. At the same time we should be careful not to diet

these patients too strictly, lest they should lose weight and become physically weak. The necessity for slow mastication of the food should be impressed on all patients. Potatoes should be avoided, except when thoroughly mashed. If the patient is inclined to bolt his food he should be advised to have it finely divided in order to avoid the accumulation of large masses above the stricture, with the danger of intestinal obstruction.

From a personal experience extending over a period of ten years in the treatment of this class of cases, I have never found it necessary to strictly diet patients suffering from this trouble. It is my experience that nearly all patients suffering from stricture have become accustomed to regulate their bowels so that they rarely suffer from constipation; this is explained by the fact that the onset of stricture is gradual, and by the time it is well developed and they come under the care of a physician they have learned that it is most necessary to keep their bowels open in order to obtain the greatest possible amount of comfort. Of course, in all cases after the stricture is well established a certain amount of residual feces remains above the stricture. The extent of damage to the mucous membrane, above the stricture, is determined to a great extent by the amount of residual feces accumulating. A periodic attack of diarrhea will be the result of this accumulation, and it is nature's method of relieving the patient. All patients with stricture suffer from what they call diarrhea, but which is not in reality a true diarrhea; it is due to the constant accumulation of mucus and blood and the subsequent irritation of the anus by the dropping of this mucus into the lower portion of the canal.

Enema.—The author knows of nothing that affords greater comfort to these patients than an enema, properly administered. We recommend a 2 per cent. solution of ichthyol and water; a 2 per cent. solution of peroxide of hydrogen; a 25 per cent. solution of the aqueous solution of krameria; a 2 per cent. solution of argyrol in water; and last, but not least, olive oil, and a solution of methylene blue, 10 per cent.

Proper Method of Administering an Enema.— It may be stated as an axiom that an enema when improperly administered is always a low enema; when properly administered it is invariably

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a high enema. With this axiom in view we will describe the proper method of administering an enema.

Some years ago an idea prevailed that in order to give a high enema it was necessary to pass a rectal tube from 12 to 18 inches up the colon, and that by so doing the water was forced into the upper reaches of the large intestine. With the advent of the *x*-ray the fallacy of this idea was shown. Previous to the very able article of Dr. Selig of St. Louis, Dr. Earle of Baltimore, at a meeting of the American Proctologic Society, gave it as his opinion that so-called high enemas, when administered by a long rectal tube, were worthless, as he was sure the tube bent on itself and simply coiled up in the rectum. Several years ago I satisfied myself of this fact by passing a tube and then having Dr. Caldwell *x*-ray the patient. I did not publish my observations at the time, assuming that most men already knew what I then discovered; but I find, even up to the present time, the impression that a high enema cannot be given except by first passing a long rubber tube, is deeply rooted in the minds of medical men and hospital officials. The second fallacy is that it is necessary to use force in order that the fluid may reach the cecum.

When an enema is given with the bag elevated several feet above the hips, as so often occurs, it is impossible to get any great amount of fluid into the intestines because of the spasm which results from pressure.

When more than moderate force is used, severe colicky pain results, due to the spasmodic contraction of the bowel; and even were it possible for the patient to stand these spasms we doubt if it would be possible to get the water any distance. The intestine is very resentful of insult and in a measure protects itself by spasmodically contracting and refusing to be insulted. Apart from the absurdity of believing that a high enema can only be administered through a long tube, and with force, one should consider the danger of perforation of the bowel from pressure. To one who has had no experience in treating intestinal cases, and who is only in the habit of administering an enema to healthy individuals, the thought never occurs that damage may be done by using too much force, because a healthy bowel will stand a

great deal of abuse; but cases are being constantly reported where an enema has resulted in rupture of the intestine and in the death of the patient. As enemas are used very frequently in the treatment of ulcerative conditions of the bowel the greatest care should be used in their administration.

Improper Method of Administering an Enema.—The amount of pressure necessary to force the water into the high reaches of the intestine should never be more than is necessary to overcome the intra-abdominal pressure; this varies between an elevation of 6 and 12 inches above the hips. In order to lessen the intra-abdominal pressure the patient should be placed in the most suitable position, and that is the knee-chest posture. It will require much greater force to get the water into the cecum if the patient is in the lithotomy position than if he is in the knee-chest posture. There are several reasons why this is so. In the first place the sigmoid floats up into the abdomen when the patient is in the knee-chest posture, considerably diminishing the pressure necessary to allow the water to reach the colon; second, the flexures at the hepatic and splenic region are less acute when the patient is in the knee-chest posture, because then the transverse colon floats close to the diaphragm; and in the third place, the aid of gravity, which is most important, is obtained by putting the patient in the knee-chest posture. Under these circumstances the water will trickle in the direction of least resistance and, aided by the force of gravity, will finally reach the cecum.

Tube.—The only tube that we use in our practice is a urethral catheter, varying in size between 10 and 15, French. This should be attached to a fountain syringe, or any other apparatus which holds the liquid; the bag or other utensil should be hung from 6 to 12 inches above the patient's hips when he is in the knee-chest posture. The catheter should be inserted inside of the internal sphincter muscle. If this method is followed the enema will be effective, and the water will gradually gravitate or steal into the higher reaches of the intestine, and in the majority of cases without pain or inconvenience to the patient. In this way large quantities of fluid can be injected into the colon with less pain and inconvenience to the patient than 4 oz. of fluid injected at high pressure. It is sometimes a revelation to those

who have been in the habit of taking an enema under the old method to find how much fluid they can accommodate with a minimum of inconvenience after they have adopted these suggestions. Matters may be still further facilitated by washing out the lower bowel, with a few ounces of fluid, preparatory to taking the enema. By so doing any gas or fecal matter that may have accumulated is expelled and the desire to void the enema, when it is first introduced, is obviated.

Posterior Proctotomy.—While this operation is commonly believed to give relief for only a short period—six months to a year—we have cases that have had no relapse for a considerably longer time after this operation. As none have been under observation longer than two years, however, we cannot assert that the relief is permanent.

The Operation.—The patient having been previously prepared as for any major surgical operation, and the bowel having been thoroughly irrigated for a week or more previous to the operation, the patient, when under the influence of the anesthetic, is placed in the lithotomy position, the sphincter is dilated and incision is made posteriorly through all the coats of the bowel into the posterior, pelvirectal space. The incision is carried from above the stricture through the sphincters and continued along the side of the coccyx and sacrum until the most depending point of the latter is reached. The cavity is now packed with iodoform gauze, a drainage tube having been previously inserted. On the third day after the operation the gauze is removed and the cavity washed out with a warm saline solution. It should be repacked with iodoform gauze at each dressing, using less gauze each time and less pressure in packing. By adopting this method the mucous membrane will eventually dip down and the same condition will happen that usually happens where the sphincters are divided; that is, the sulcus results. This operation has many disadvantages in that incontinence is almost certain to result, and also that systematic dilatation has to be maintained during the rest of the patient's life.

Excision.—Very excellent results have followed this operation but the mortality is high. The question arises whether we are justified in subjecting the patient to the risk attending this

operation, especially as these patients are generally in pretty good health, barring the bowel condition. I do not recollect any case where the general health of the individual was seriously impaired. Undoubtedly, something must be done to relieve the stricture, otherwise intestinal obstruction will result; but would it not be better to advise these patients to undergo a colostomy, rather than run the risk of the more radical operation? Of course, I am speaking of the tubular variety of stricture; as in the annular, and even in the tubular, where the stricture does not extend over an inch or an inch and a half, and is situated close to the anus, the danger of the radical operation is practically *nil*.

The Thyrotome.—This instrument was devised by the author on the principle of the electrocautery for the purposes of dividing rectal strictures of the umbrella type, hypertrophied valves of Houston, polypi, and especially of stopping hemorrhage from folds of mucous membrane, which cannot be grasped with a forceps. The following description is from the original account in the *New York Medical Journal*, January 19, 1907:

"The thyrotome consists of a shaft composed of two parts, one sliding upon the other, and each ending in an approximating jaw at right angles to the long axis. These jaws may be approximated when the instrument closes. The lower shaft is fixed, and is attached to the handle of the instrument, through which electric connections are made. These are carried through the lower shaft, ending in a platform in the lower jaw, which is the heating part of the instrument. Since it is not desirable to have the same degree of heat as is necessary in an ordinary or actual cautery, the platinum terminal is covered by moderately thick copper plate, through which heat is transmitted. The upper shaft slides on the lower, by means of a ratchet and a key fitted to its handle extremity. By means of this key and ratchet the jaws are separated and approximated, and pressure between the jaws exerted.

"After the rectal speculum is in place, the tissue to be divided is selected; the jaws of the instrument are separated, and the thyrotome is then passed through the speculum until the upper jaw passes above the valve or fold of tissue on which it is proposed to operate. The jaws of the instrument are then brought

FIG. 110
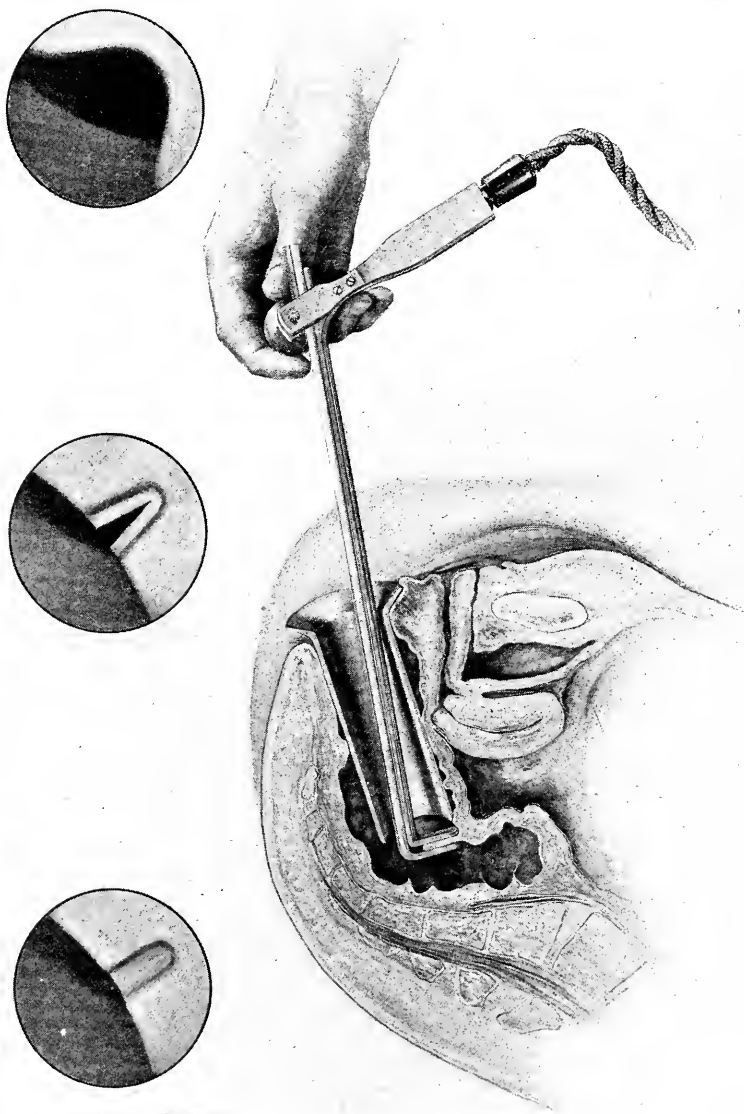
Lynch's thyrotome.

together by means of the ratchet, and, when a good grip is obtained, the electric connection is made and the current turned on.

"It takes about three or four minutes, with a moderate heat, to thoroughly sear the tissue. Afterward, by means of a knife with a long handle, the valve is divided throught the centre of the seared portion. It is not absolutely necessary to divide the valve with a knife, as the seared portion will slough off within a few days; but, by cutting, immediate relief of the obstruction is, of course, obtained.

"The advantages of this instrument over the Pennington clip, when used for the same purpose, are: (1) The instrument may be had for the cost of a half-dozen clips, and lasts for a lifetime; (2) the valve may be divided at one sitting; whereas it takes a clip several days to cut through, and it often happens that the clip must be applied two or three times before the valve is satisfactorily divided; and (3) its field of usefulness is not limited to one operation. Over the electrocautery, the advantages of the thyrotome are: (1) An absence of hemorrhage; and (2) the heat generated is about a twentieth part of that of the cautery, yet it does the work more effectually."

The Radical Operation for the Removal of Stricture.—Any one of three or four methods may be adopted. First, the *perineal method;* second, the *sacral;* and third, the *combined operation.* There is no question if the stricture does not extend more than one inch above the peritoneal reflection but that the perineal operation gives the best results; as the lowest mortality is recorded from this procedure and it is therefore the safest operation. There is one point to be considered, however, and that is the fact that it is difficult to say positively how far the stricture extends if it is of small caliber. Under such circumstances it may be necessary to open the abdomen in order to determine the amount of intestinal involvement and to see if an operation is justifiable; because the sigmoid, though not actually contracted, may show evidence of inflammation which would eventually end in cicatricial contraction. This being the case, it is obviously irrational to undertake to cure the condition by a radical operation. Having determined the extent of the stricture and decided on the perineal operation, the patient is prepared and the operation continued

in the same manner as that for cancer of the bowel. We will, therefore, not repeat the different steps of this operation, but will refer the reader to page 504.

The sacral operation is indicated only in those cases where the tumor is situated at the peritoneal reflexion; the object being to save as much as possible of the healthy mucous membrane below the stricture, and later on do an end-to-end anastomosis. As an end-to-end union in this region always results in stricture, it is obvious that such a procedure is contra-indicated in stenosis of the rectum.

Numerous other fanciful procedures have been suggested for circumventing stricture, but anyone who has operated in this region and who knows the difficulties encountered, even in the simplest procedures, realizes how impossible are some of the stunts that have been suggested. Another point to be considered is this: That any union of the bowel that is not covered by the peritoneum will almost inevitably result in stricture; we therefore will not review any of these grotesque operations.

As a preliminary measure to excision of the rectum, for stricture, we have found appendicostomy very useful. It keeps the contents of the bowel fluid; the constant irrigation is less troublesome by this method than by the rectum; and there is very little likelihood of any accumulation occurring if the bowel can be irrigated through the appendix. Furthermore, this operation, in competent hands, should have no mortality other than that of the anesthetic. It offers the advantage that after the operation a Murphy drip can be employed, which would otherwise be out of the question. The distention following operation is also obviated when this method is employed, and it has the advantage over a colostomy of not embarrassing the patient; then there is the fact that, unless a colostomy is made in the transverse colon, it is apt to be a source of embarrassment to the surgeon in the delivery of the sigmoid. It has the further advantage that the patient can be fed through this opening, if occasion should demand, owing to the inability of the stomach to retain food.

Having reviewed all the different methods of treating stricture, it naturally occurs to the reader to ask what procedure or

procedures we have found most available in our practice, and
what treatment we advise. If the stricture is within an inch
and a half of the anus we think excellent results can be obtained
by gradual dilatation and the application of tampons saturated
with ichthyol, or with ichthyol and glycerin; or perhaps some

Fig. 111

Extensive stricture of the colon, brought to the attention of the author by Prof.
Stockard, of Cornell. (Lynch.)

mercurial preparation, in lues; also, last but not least, Wright's
solution. If the stricture is high up, not within the reach of the
finger and involving several inches of the valve, we should advise
a colostomy; but if the patient refuses this there is left the
radical operation. The patient should, however, fully understand
all the facts in the case and the danger attending this operation

before accepting it. If he is then willing to take the risk, you should advise it only when the man you recommend to perform the operation has had previous experience. It is one of the most difficult operations in surgery and requires an exact knowledge of anatomical relations as well as a dexterity that can only be acquired through experience. One must be guided entirely by touch as, working in a very narrow space, it is impossible to see anything.

CHAPTER XIII.

PROLAPSE OF THE RECTUM.

PROLAPSE of the rectum, as ordinarily understood, may mean either a slight invagination of the mucosa, a complete sagging of all the walls of the bowel, or the invagination or intussusception of one portion of the bowel into the other. For the sake of simplicity we will divide the prolapse into incomplete and complete.

By incomplete prolapse we mean that form of prolapse in which the mucous membrane only is involved. Complete prolapse, or procidentia, is where all the tunics of the bowels are concerned.

Incomplete Prolapse.—This is usually found in young children and in old people; it is also associated with hemorrhoids, straining at stool following severe diarrhea, benign new growths in debilitated patients, and those suffering from locomotor ataxia. It occasionally occurs following the prolonged use of saline cathartics. When it occurs following a benign new growth, particularly a polypus, the prolapse is funnel-shaped. The mucous membrane may protrude all around for several inches and closely resemble a complete prolapse. It can, however, be readily distinguished from the latter by the fact that the folds run up and down parallel with the long axis of the gut; whereas, in complete prolapse, the folds encircle or run around the bowel. This condition in children, when not due to polypi or pinworms, is usually occasioned by sitting on the chamber for a long time and straining; a habit not uncommon and due to the impression some mothers have that children should be allowed to sit on the chamber until they have emptied their bowels. Prolonged straining at stool, due to the presence of phimosis or calculus, must be considered as an etiological factor in children.

Of course the same condition can, and does, occur in adults; but not so frequently.

Symptoms.—By getting the patient to strain, bringing the protrusion outside of the rectum, a diagnosis can easily be made. This is not always possible, however, unless an enema has been given. When due to hemorrhoids or a polypus, it would usually be associated with bleeding at stool, the passage of mucus and sometimes pus. A proctoscopic examination should be made in all cases to determine the cause. When due to pinworms, it is usually associated with itching, irritability, and disturbed sleep. In grown people the diagnosis is easier, as the patient can co-operate and give an intelligent history of the case.

Complications.—Gangrene sometimes results, due to the cutting off of the circulation by a very tight sphincter. Under such circumstances infection and an abscess may follow.

Diagnosis.—The diagnosis of incomplete or complete prolapse can be made at a glance, as in incomplete prolapse the folds or sulci are longitudinal and radiate from the centre to the circumference, whereas in the complete variety the folds are circular.

Treatment.—This depends on the causative factors, and the removal of these must be the first step in the treatment. Pinworms in children should receive attention. Mothers should be advised not to compel their children to sit on the chamber for long periods, as is customary in some families. Polypi should be removed, and any other factor concerned should be corrected. In very young children it is possible to cure prolapse, after the cause is removed, without the aid of surgery. It should be seen to that the child has an easy movement without straining; if necessary, a suitable cathartic should be administered; or an injection, as the case may demand. Sometimes having the child lie on its back on a bed-pan during the movement will help. If the prolapse occurs between the stools, as is sometimes the case, due to a relaxation of the sphincter, then the gluteal region should be strapped with adhesive plaster which in time should assist the cure, provided the other methods of treatment are followed.

In old people it is a difficult matter to devise anything palliative. A surgical operation alone gives satisfactory results; for, even though the original cause be removed, the tissue and muscle are so relaxed that palliative measures do not accomplish

much. The operative procedure in such cases should consist in removal of the excessive mucous membrane, either by the cautery or after the method of Whitehead. (The latter operation is described in the chapter on Hemorrhoids, see p. 109.) Other methods, such as the injection of irritating solutions, are unscientific, dangerous, and cannot be controlled.

In tabetics, radical measures are out of the question and palliative measures are of little avail. The writer has found the following simple procedure very effective. The prolapsed tissue is anesthetized with cocain or novocain by injection. A curved needle is threaded with No. 2 plain catgut, which has previously been moistened in water to make it more pliable; the needle is then passed around the prolapsed tissue and the suture tied, not sufficiently tight to strangulate, but enough to produce stasis of the blood supply. By repeating this process on two or three occasions a fibrous mass will be formed which later on can be removed without difficulty. Of course this has particular reference to the prolapse which is not exactly associated with hemorrhoids, but a prolapse of the mucous membrane in the hemorrhoidal area so frequently observed in patients suffering from tabes.

Complete Prolapse.—Complete prolapse or procidentia of the rectum is an invagination, due either to extreme mobility of that organ or to an elongation of its supports due to constant pressure. Any one of these conditions may be owing to imperfect fixation at birth, or secondary to any condition which causes a constant drag on the rectal attachments.

The Pelvic Fascia.—Before entering into discussion as to the etiological factors concerned in prolapse of the rectum, it may be well to give a brief description of the pelvic fascia. There is some question as to whether the ordinary description of the pelvic fascia is entirely correct. Some anatomists doubt the existence of fascia over the sacrum, and a great many believe that there is no fascia posterior to the great sacrosciatic notch. They believe that what is considered fascia is nothing more or less than fibrous tissue, and is not fascia in the true sense. The more common description of pelvic fascia, is as follows:

Pelvic fascia is divided into two parts: (1) parietal and (2)

visceral, or diaphragmatic. The parietal fascia takes its origin
as the direct continuation of the fascia of the psoas magnus
muscle at the level of the pelvic brim. It sweeps downward
upon the anterior aspect of the sacrum and coccyx, being directly
attached to the periosteum. The fasciæ of both sides are con-
tinuous over the sacrum and coccyx and pass laterally over the
sacrosciatic foramina to find attachment to the spine of the
ischium. That portion of this fascia which is in relation to
the pyriformis muscle is termed "pyriformis fascia." From the
ischial spine to the lowest part of the symphysis pubis the parietal
layer is thickened to form the "white line" (arcus tendineus).
The white line gives rise to four layers of fascia, two of which
are parietal, clothing the medial aspect of the obturator internus
muscle. In view of this relationship the fascia may be termed
"obturator fascia." It is composed of two divisions: an upper,
sweeping superiorly from the white line toward the pelvic brim, and
a lower, passing inferiorly from the white line to form the lateral
wall of the ischiorectal fossa, gaining attachment to the ischial
tuberosity and ramus (inferior). The upper layer of the obturator
fascia is attached to the periosteum on the back of the superior
ramus of the pubis, along a line which descends from the junction
of the middle with the lower third of the external obturator artery
to the upper margin of the obturator foramen. It then continues
across the obturator foramen, missing the superior ramus of the
pubis by an interval sufficient to form the obturator canal.
Medial to the obturator foramen the parietal fascia blends with
the periosteum on the back of the pubis along a line which descends
toward the apex of the pubic arch and passes below the line of
attachment of the visceral layer. The lower layer of the obturator
fascia clothes the medial aspect of that part of the obturator
internus which lies below the white line, and forms as has been
noted the lateral wall of the ischiorectal fossa. From each
side this fascia extends medially from the margin of the pubic
arch to the side of the urethra to form the "superior fascia of the
urogenital diaphragm." Blending with the fascia of the opposite
side it is continuous around the anterior border of the levator ani
with the fascia on the under surface of that muscle.

The visceral pelvic fascia sweeps in an oblique transverse

plane across the whole pelvic cavity. It consists of two layers
and may be divided into (1) the visceral fascia proper, that layer
which clothes the upper surface of the levator ani and the coc-
cygeus and gives an investment to the pelvic viscera, and (2) the
diaphragmatic fascia proper, that layer which clothes the under
surface of these muscles. Both layers have a common circular
attachment to the parietal fascia. This attachment covers over
a small extent in front. Here on the back of the symphysis of
the pubis, about three-fourths of an inch above its lower border,
the visceral fascia proper is directly attached to the bone. This
attachment is above that of the parietal layer. From here the
line of attachment falls to the spine of the ischium. It necessarily
meets the upper border of the parietal layer, crossing the same
about half an inch from the midline on the back of the sym-
physis. To the small bare interval between the parietal fascia
and the anal fascia proper the anterior fibers of the levator ani
take origin. The thickened character of the line of attachment
running from the back of the symphysis to the ischial spine
(white line) has been noted. From this white line the fibers
of the greater part of the levator ani usually take origin. From
the ischial spine the line of attachment continues to fall until it
reaches in the midline the junction of the fourth and fifth pieces
of the sacrum. Were it not for the fact that the urogenital organs
and the rectum occupy a part of, or at least project into the
pelvis, the visceral fascia would simply be two layers of fascia
enclosing the levator ani and coccygeus muscles attached as
described above. To complete the description, therefore, it is
necessary to consider how the distribution of the two layers is
affected by the presence (1) of the genito-urinary organs and
(2) of the rectum.

The visceral fascia proper passes inward from the back of
the pubis in front and from either white line laterally to meet
the urogenital apparatus at the junction of the prostate and the
bladder. Here it splits into two parts, one passing up to cover
the bladder, and the other passing down to cover the prostate.
The sheath of the prostate at the apex of the gland gains an
insertion around the opening for the urethra in the urogenital
diaphragm. This, therefore, is the region where parietal and

visceral fascia blend. To a line on the surface of the prostate, slightly below the junction of that gland with the bladder, the visceral fascia proper has been noted passing from the symphysis. Four thickenings of that part of the fascia (two medial and two lateral) have been termed the puboprostatic ligaments.

The diaphragmatic fascia comes into relation with the genito-urinary organs only at the apex of the prostate. Here it blends with not only the superior fascia of the urogenital diaphragm (parietal pelvic fascia) but also with that part of the visceral fascia proper which encloses the prostate.

From the posterior part of the circumference of its attachment both layers of the visceral fascia sweep toward the rectum. From the diaphragmatic layer an investment is carried down over the anal canal almost as far as the anus. The line at which it starts marks the recto-anal junction. Owing to the close apposition of the rectum and coccyx, the former is apparently clothed on its posterolateral aspects by a portion of the pelvic fascia. Actually the rectum is merely closely applied to a part of the visceral fascia proper which clothes in that region the upper surface of the coccygeus muscle.

Etiology.—As to the many factors which bring about prolapse there is a wide divergence of opinion. Some consider it a hernia pure and simple; others believe it is due to the cutting away of the supports, or the relaxation of the sigmoid above it.

According to Jeanell, the elongation of the mesosigmoid is the primary factor, and this view is supported by Raynol. On the other hand, Lenorment believes that the levator muscle is the principal factor, as, in his mind, this is the chief protection against sagging of the rectum. Zuckerkandl is of the opinion that it is hernia, due to an abnormally deep cul-de-sac into which the small intestines drop, and that the pressure exerted by the small intestines gradually works this sagging down until the musculature gives way and the rectum appears outside of the anus.

This view is also upheld by Moschcowitz. Like many other controversies over an unsettled problem, there is truth on all sides; but it is more than probable that a combination of all circumstances will be found in this condition. There is no doubt but that in certain cases, and all have observed these cases,   .
prolapse is purely hernia.

Such a case has been recorded by Ball where the entire intestine, including the cecum, was prolapsed, forming a double spiral.

If, as Zuckerkandl, Moschcowitz and others claim, it is a hernial protrusion, then in all cases the opening would be posterior and inside of the anus, the prolapse forming almost a complete circle. But we all know that in the majority of cases the opening is central; therefore, this fact argues against an anterior hernia, at least where the prolapse is pronounced, with a central opening.

In early childhood the pelvic portion of the rectum is straighter and more vertical; more of an abdominal organ and more movable than in later life. The supports given by the peritoneal reflections and the fascia are less, on account of the undeveloped condition of the prostate and uterus. The sacral curve is less marked.

The connective tissue between the mucous and the muscular coats of the rectum is especially lax in children. Prolapse is therefore not an infrequent occurrence, especially where straining has been caused by the presence of any irritation. It occurs in adults, but chiefly in old age, when the muscular tonicity has been weakened; and it is favored by any chronic vesical or pulmonary conditions which produce frequent straining on coughing.

Quénu's comment on a report by Proust shows the influence which hysterectomy may have on the development of rectal prolapse. Proust's patient, a woman, aged forty-eight years, whose prolapse dated back eight years, had previously undergone a supravaginal hysterectomy. Laparotomy showed a very deep Douglas pouch which was obliterated. The sigmoid loop was anchored above the uterine stump to the remnants of the round ligaments and to the peritoneal covering of the bladder. Two months later a perianal wiring was made to correct a tendency to eversion of the anal mucosa. A year after the operation there is a slight abdominal eventration; the prolapse remains cured; the silver wire is still unbroken.

Quénu says: "The uterus and rectum have a common means of suspension; therefore any cause bringing about the fall of one endangers the fixity of the other. Hysterectomy deprives the rectum of the anterior support afforded it normally by the

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uterus. The weakening of the pelvic floor favors the prolapse of both organs."

Fieschi[1] thinks the cause for this condition is dependent upon a resistant pelvic floor and a lack of proper function of the lifting apparatus of the rectum. He regards, with Rotter, as the principal factor of the prolapse an improper condition of the closing apparatus of the rectum. He discusses the physiological act of defecation, which consists in the pressure of the colon on the feces from above, over which the sphincter is stripped with the aid of the levator ani. In the insufficiency of the latter, caused by various factors, there is produced at first a slight, and, on persistence of the condition, a permanent prolapse.

Vidakowich[2] regards a full bladder as a powerful protection against prolapse of the rectum. By filling the bladder the small intestines which transmit the pressure of the abdominal muscles are lifted out of the pelvis and the fold of Douglas is raised. The rectum is pressed into the convexity of the sacrum and thus its convolutions are increased, and finally the opening of the pelvis is closed by a distended bladder and the force of the pressure of the abdominal muscles is dispersed in various directions. He proves, by direct manometrical measurements, that pressure from the abdominal muscles transmitted to the part of the rectum below the bladder is less when the bladder is full than when it is empty. He believes that in the beginning of the prolapse its increase can be avoided by advising the patients to empty their bladders only after defecation. Good prophylactic measures are defecation while lying with the feet hanging and especially in Mummery's stooping position, while the bladder is kept filled at the same time.

Complications.—The most serious complication of complete prolapse, especially of the hernial type, is rupture of the peritoneal cul-de-sac with evisceration of the intestines. Quénu reports five cases of spontaneous rupture of the rectum and in four out of five cases the rupture was preceded by complete prolapse of the rectum. The prognosis is usually good if the prolapse has not existed for too long a period, and even then a great deal can be done to repair the injury.

[1] Clin. chir., 1913.   [2] Zentralbl. f. d. ges. Chir. u. d. Grenzgeb.

Treatment.—The treatment of complete prolapse depends a great deal on the extent of the invagination. The writer has had several cases of very marked prolapse, and one was complicated by a complete prolapse of the uterus and vagina, with adenoma and multiple diverticula of the sigmoid.

A detailed report of a case, with the operation, is given later.

Fig. 112

Complete prolapse of rectum, vagina, and uterus. (Lynch.)

Prophylactic and Medical Treatment.—There is no one method or operation that is suited to all cases. To treat prolapse intelligently requires a broad general knowledge of the principles involved. The writer does not believe that palliative measures are of much avail except in young children. Once the prolapse is well established, an early recognition of the causes that bring about this trouble should make it possible to avoid this very distressing condition. There is no question but that a great many women suffer from prolapse in some degree (especially those who have borne children), and this is evident to anyone who has had occasion to make frequent proctoscopical examinations.

Therefore, prophylactic treatment in women should result in
preventing this condition.   Subinvolution of the uterus, rupture
of the perineum and levator ani muscle, relaxation of the broad
ligament, and impaired positions of the uterus (especially retro-
flexion and retroversion), should receive immediate attention.

Fig. 113

Prolapse of the rectum.   (Lynch.)

Some men suffer from prolapse in a slight degree, due to the
inveterate use of saline cathartics.   This is brought about by
congestion and straining, with a blocking of the return circulation.
These patients usually complain of a feeling of unfinished stool.
If the salines are kept up for a sufficient length of time there is
undoubtedly a loosening of the rectal supports.   The constant
straining results in forcing the small bowel into the cul-de-sac,
and it is only a question of time when the prolapse becomes
evident.
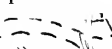
Polypi, particularly of the adenomatous type, are found in

men, women, and children (usually as the result of infection). They are particularly frequent in young children; the multiple adenomata being more frequent in adults. Whenever found and accessible they should be immediately removed by the snare; when they are multiple, ileostomy is indicated.

Hemorrhoids, proctitis, sigmoiditis, or papillitis should be properly corrected. Enteroptosis must be considered and treated by supports, appropriate medication and diet.

If the coccyx is to be removed, then the levator muscle should be brought together and any opening should be closed, as otherwise a prolapse will surely follow.

In young children and in old people constitutional treatment is indicated. It increases their general resistance and helps to put them in a better position to withstand surgical measures, if necessary. In very young and debilitated children this form of treatment is particularly useful and is fraught with the best results. Besides, with constitutional treatment and proper hygienic measures, children will often be entirely cured without surgical intervent⟨ ⟩ ⟍ bowels should be kept open; straining should be prevented; and the child move its bowel lying on the back or side. In complete prolapse electricity or injection of irritants, with the hope of causing adhesive inflammation, is unscientific, cannot be controlled, and may result in serious harm to the patient.

Surgical Treatment.—The operations that have been suggested for prolapse are as numer⟨ ⟩ies that have been advanced as to its cause. The reason of this is that it is assumed by most men that prolapse of the rectum is incident to some one cause. We do not believe that this is so. There is no question but that in a small percentage of cases prolapse is a hernia; but that all cases of prolapse are of this type is a mistaken conclusion. When due to a hernia it is of the cochlear type with the opening inside the anus. The operation must be adapted to each case, and when an operation is indicated, it is very important to decide beforehand the best method of procedure. If the case is studied intelligently, and the operation is adapted to the case, good results must follow. It must be remembered that the rectum is not a straight but a

sinuous tube. When this becomes straightened out from pressure there must be some prolapse.

There are three degrees of prolapse recognized by most authorities:

The *first* degree, where the prolapse begins at the anal margin and the external surface is continuous with the skin.

In the *second* degree, the prolapse begins at a point some distance from the aperture and forms an intussusception through a fixed portion bordering outside of the anus.

In the *third* degree the same condition exists, except that the prolapse does not protrude outside of the anus. It is quite evident that in the so-called second and third degrees, the cause of the trouble is high up, the levator ani holding its place and the upper gut becoming invaginated at a fixed point. In the first degree the probabilities are that the relaxation is low down and the cause of the trouble is in the lower part of the rectum, due possibly to insufficiency of the sphincter or the levator muscles.

Fieschi, who says that prolapse is due to lack of proper function of the levator and relaxation of the ▮▮▮▮▮▮ has devised the following operation, based on this theory:

It consists of an incision of the skin in the shape of an equilateral triangle 7 cm. on each side of the rectum to produce a thorough scar formation. The ligaments between the levator and sphincter are severed, whereby the anal ring descends while the levator rises 6 cm. Next a muscle bundle 10 cm. long and 3 cm. thick of the ▮▮▮▮▮▮▮▮ on both sides is separated from the sacral bones, and this is turned in such a manner that it runs around the anal opening and is fixed with three catgut sutures anteriorly to the ligamentum arcuatum. Over this the triangular skin defects are closed. In this manner the operator obtains a functional separation of the sphincter and levator, and the fortification of the perineal floor.

Bordenheuer, in 1902, and Samter, in 1907, and Quénu and Duval, in 1910, all suggested a method of obliteration of the cul-de-sac. This operation presupposes that prolapse is a true hernia. This is so only in a limited number of cases. Moschcowitz, in November, 1912, suggested this same operation, with some very slight modifications. Quénu puts in a

few sutures to obliterate the sac and Moschcowitz does a little more elaborate operation (Fig. 114).

Pagenstecher or silk sutures are passed circularly around the cul-de-sac of Douglas and tied. The lowermost suture is placed about an inch above the inferior extremity of the cul-de-sac; similar sutures, six to eight in number, are passed at intervals until practically the entire pouch of Douglas is obliterated.

FIG. 114
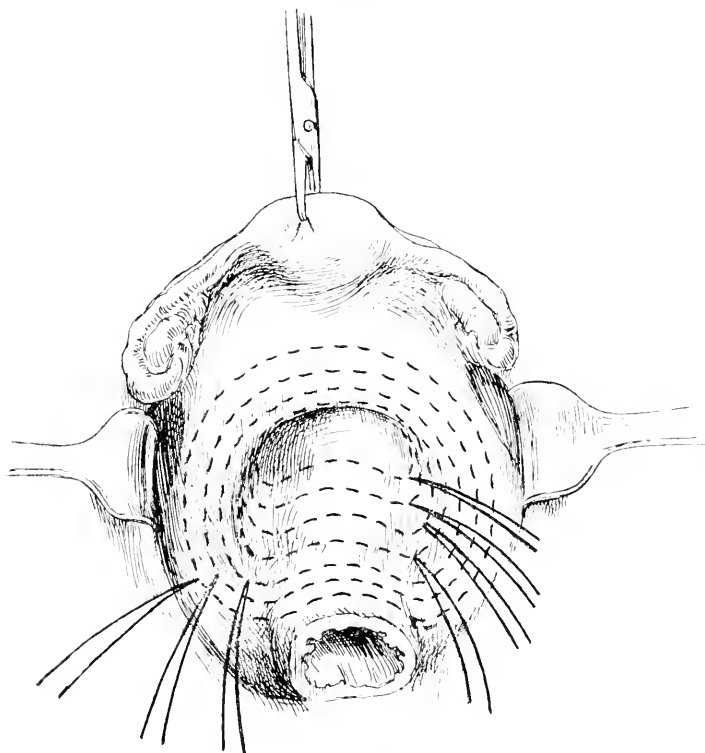
Moschcowitz's method of closing the cul-de-sac in prolapse of the rectum.
(Lynch.)

The method suggested by Van Buren is as follows, and is only "*Previle* to very mild prolapse and not to prolapse of a marked degree:

The patient having been anesthetized, the prolapse is brought down, thoroughly washed off, and the circumference of the gut

cauterized. After the cauterization some sterile olive oil is applied and the prolapse is reduced. Van Buren then inserts a drainage tube and straps the buttocks together by means of adhesive plaster. The bowels are confined for four or five days, after which a 2 per cent. solution of peroxide of hydrogen is given to relieve the bowels. This method is recorded for what it is worth; the writer has never tried it, but believes that there is less danger in a more radical operation than there is in this. It would seem that severe inflammation might follow the cauterization and serious effects result.

Rectopexy is performed in the following manner: The patient is prepared in the usual manner, the bowels having been thoroughly emptied and afterward irrigated with a 2 per cent. solution of peroxide of hydrogen. The anus, perineum and sacral region are shaved and afterward painted with tincture of iodine. This operation can be done either under sacral anesthesia or with a general anesthetic. The patient having been anesthetized, the prolapse is brought down to its full extent by traction forceps, held in position by an assistant. A semicircular incision of about two inches in length is made between the coccyx and the posterior commissure; this is carried through all the tissues into the retrorectal space. The index finger, covered by a piece of gauze is introduced into the wound and the rectum is freed from the coccyx and sacrum as high as the attachment of the mesorectum, and on the sides as far as the attachment of the lateral ligaments. The entire surface is now curetted by means of the index finger covered with gauze. At this juncture the assistant reduces the prolapse, which is brought out posteriorly through the semicircular incision. The muscular wall of the exposed prolapse is curetted. Silkworm-gut sutures are now placed about half an inch apart. They should embrace as much of the circumference of the gut as possible. After having been passed through the muscular wall of the gut (the sutures having been placed) the upper sutures are each in turn threaded on a Peasley needle, carried through the skin on either side of the ╎ a true The other sutures are treated in the same way and they are all finally tied over a piece of gauze placed on the back of the sacrum. In this way the curetted surface of the muscular wall of the

bowel is brought into intimate contact with the anterior wall of the sacrum, adhesive inflammation results and the gut is held in position in this way. It is not a very satisfactory operation and recurrence frequently follows.

The writer has found the following operation to be very serviceable in some cases, provided the prolapse is not too pronounced.

The patient, having been prepared as for any laparotomy, is anesthetized, a median incision is made, and after the peritoneum is opened the patient is put in the Trendelenburg position. The small intestines are packed away with a single towel. The self-retaining retractor holds the edges of the wound apart and allows very free access to the pelvis by the operator. If in a female, a vulsellum forceps is placed on the uterus and it is lifted up out of the pelvis; the rectum is also lifted up and held taut in position by an assistant. A slit is made in the peritoneum, first on one side and then on the other and both leaves of the mesentery are slit as far down as the cul-de-sac; the bowel is allowed to fall into the space between the two leaves of the | and the mesenteric leaves are attached or sutured to the bowel. By this method the attachments of the rectum are shortened, and after this the cul-de-sac is obliterated, the abdomen closed and the patient returned to bed. This operation has proved very satisfactory in selected cases. It is particularly applicable to those cases where there is intussusception, and where the prolapse does not protrude outside the anus.

The following case of rectal prolapse, which is given in detail, was published by the writer in the *New York Medical Journal* of September 4, 1909:

"Case of prolapse of ⟨⟩ with multiple adenoma of rectum and sigmoid, and diverticula of the sigmoid.

"The patient, C. L., a widow, aged seventy-one years, houseworker, was admitted to St. Mary's Hospital, Hoboken, N. J., May 7, 1909.

"*Family history*, negative.

"*Previous Personal History.*—Patient had three children, two born living, one born dead, all of whom were delivered with forceps under chloroform anesthesia. Her first child was born forty-two years ago, when the mother was twenty-nine years

old. Her last child was born thirty-seven years ago, when she was thirty-four. At the birth of the first child she received a severe laceration of the perineum which was followed by a partial prolapse of the uterus. Each succeeding delivery increased the laceration of the perineum and at her last delivery it extended into the rectum. As time passed, the degree of the prolapse increased until about ten years ago it was complete, so far as the uterus was concerned, and the rectum was then just beginning to descend.

"She was admitted to St. Mary's Hospital, March 19, 1904. At that time the diagnosis was complete laceration of the perineum which resulted in complete prolapse of uterus and rectum. The rectal prolapse then measured about six inches.

"On April 4, 1904, she was operated upon by Dr. G. Bozeman for repair of the perineum and sphincter ani. It was suggested, after she recovered from the operation, that she submit later to a colopexy and a ventral fixation; this she refused. However, she seemed much benefited at the time. Shortly after she returned home, both uterine and rectal conditions began of about her again, but she managed to get along fairly well and attend to her work until a short time before she was admitted to the hospital this last time.

"She stated that about nine months before, the prolapse of the rectum became very pronounced and gradually increased up to the date of admission. For the last few weeks prior to May 7 her life had become almost unbearable, as she could not move around and suffered intensely from tenesmus, hemorrhage, and itching.

"On May 7r incision. The muscular ᵕ by Dr. Livingstone Lewis, and found her suffering severely. Examination revealed complete prolapse of uterus, vagina, and about twelve inches of rectum. All could be replaced with difficulty, but would immediately return on removing the support. The vaginal wall was much thickened, but not ulcerated, and there was a complete absence of perineal body. A very thin sphincter ani could be found, but it had lost its elasticity, and was so attenuated that it was practically worthless. The rectal mucous membrane was thickened and bled very easily. Examination

with finger revealed numerous polypi, probably of the adenomatous type. The case did not appear favorable for operation on
account of the age and apparent feeble condition of the patient.
In appearance she looked to be eighty years of age rather than
seventy-one. My conclusion was that if the patient wished the
operation, with full understanding of the danger and was willing
to take the risk, I would undertake to do what I could.

FIG. 115
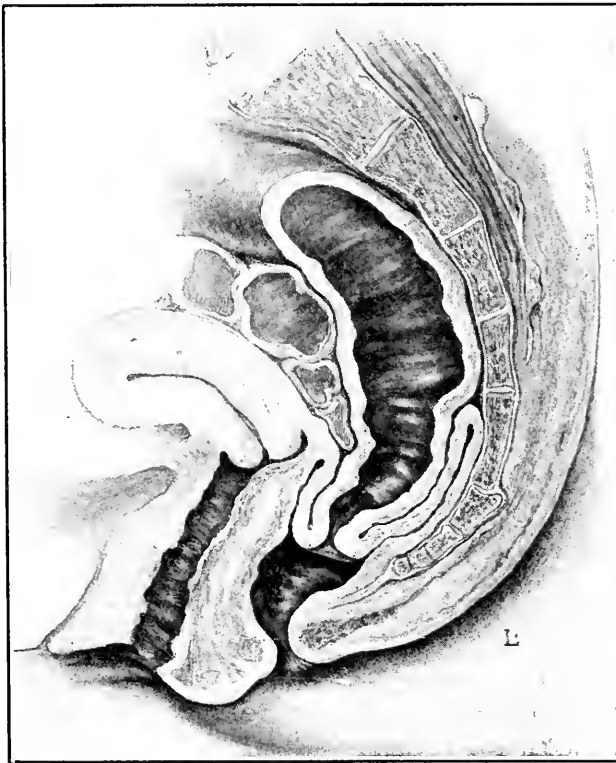
Shows relation of uterous to the sigmoid and rectum. It also shows the sigmoid
descending into the rectum (prolapse of sigmoid). (Lynch.)

"After full explanation to the patient, she insisted upon the
undertaking, assumed for herself all responsibility of result, and
was prepared for the operation, said preparation being carefully

attended to for two days.   In the operation I was assisted by
Dr. Lewis and Dr. Van Deesten, of St. Mary's, Hoboken.

"*Operation*, May 9, 1909. A median incision was made and the
abdomen opened.   The recti muscles were found atrophied
with much separation; so much so that postoperative hernia
was feared.   The uterus and annexa were next removed and the
broad ligaments and round ligaments sewed together in order
to strengthen the pelvic floor.   The sigmoid was next pulled
up out of the pelvis and examined.   It was extremely long, very
flabby, and covered by diverticula of varying sizes.   Inside of the
sigmoid a number of polypoid tumors could be felt.

"It was not deemed wise to resect the bowel on account of
the age of the patient.   The sigmoid was therefore suspended
to the abdominal wall after the method of Professor Tuttle.
The abdomen was now closed very carefully by bringing the
muscles together and afterward overlapping the fascia.   The
patient was next put in the lithotomy position and as the rectal
prolapse was apparently not influenced by suspension of the
sigmoid, it was decided to excise the rectum after the method
of Mikulicz as modified and given by Tuttle in his *Diseases
of the Anus, Rectum, and Pelvic Colon* (p. 699), with some slight
changes.

"*Technique.*—The patient being in the lithotomy position,
with hips well elevated, the prolapse was dragged down as far
as possible with traction forceps.   It was then clamped by two
vulsella and held in this position by assistants.   The elevated
position of the hips allowed any coil of small intestines to slip
out of the peritoneal pouch and so escape the danger of being
wounded.   After the intestine was dragged down it was sur-
gically cleansed and dried by sterile gauze.   Sterilized gauze
was now used to pack the gut in order to avoid soiling the
wound.   After these preparations an incision was made
through the mucous membrane about an inch from the skin,
upon the interior surface of the gut.   Dissection was carefully
carried through the entire thickness of the intestine, all bleeding
being checked as it occurred, until the peritoneal cavity was
opened.   Here Cunningham uses a clamp, which is an improve-
ment on Mikulicz's method.   When this was done, the serous

membrane of the intussuscepted portion of the gut was brought into view. This membrane was cut through and its upper edge sutured to the peritoneal edge of the wound in the anterior

Fig. 116

Shows the condition of the patient four weeks after the first operation for prolapse. (Lynch.)

Fig. 117

Shows the final results six weeks after second operation for repair of perineum. (Lynch.)

layer of the prolapse. Thus, step by step, the peritoneal pouch was closed. This having been accomplished, the entire thickness of the intussuscepted gut was cut through little by little, and its muscular and mucous layers sutured by chromicized catgut to the mucous membrane surrounding the margin of the anus at the site of the original incision.

"In this manner the entire prolapse was excised, and end-to-end union of the gut accomplished.

The ends of the sutures in the muscular and mucous layers were left long, in order to steady the parts and prevent their retraction while the operation on the other portion of the circumference was being made. All bleeding points were caught, and either twisted or ligated during the operation.

"It should be noted that if, after completing the excision, the edges of the mucous membrane are not in accurate apposition, a continuous suture should be applied half-way around the gut and tied, and the other half afterward treated in the same manner (a complete suture is apt to cause contraction). The long end of the sutures should then be cut off and the wound dusted with boric acid or thymol iodide.

"The operation being thus completed, the gauze was removed, a Lynch tube introduced, and the buttocks strapped with adhesive plaster to prevent the tube from coming out. The perineum was now very hurriedly repaired and the patient returned to bed.

"*After-treatment and Results.*—The bowels were confined for eight days by administration of opium to quiet peristalsis. I used and prefer tinct. opii deod.; ℥x, for five or six days.

"It is to be noted that if a movement should occur before the end of the eighth day, the bowels should be thoroughly irrigated with warm saline solution (about a quart at a time). In this way they are kept thoroughly clean, and the oozing of feces which would otherwise occur is avoided.

"The patient made an uneventful recovery, the abdominal and rectal wounds healing *per primam*.

"About the fifth day after the operation the perineal wound showed evidence of infection, whereupon the silkworm-gut stitches were removed and the vagina washed out with warm

boric acid solution; this was continued until all evidence of infection had disappeared.

"The result of the operation was excellent, as the patient was out of bed at the end of the second week and has had no setback up to this time (June 18, over five weeks), and has gained several pounds in weight. She has practically no control of the sphincter, but this was the case before the operation. She is now comfortable, and we hope at some future time, notwithstanding her advanced age, to repair the perineum and narrow the anus, in order, if possible, to give her control.

"The points of special interest in connection with this case, as they appear to me, may be thus summarized:

"1. The existence of a complete prolapse of uterus and vagina with multiple adenoma and multiple diverticula in one patient, is an anatomical and surgical curiosity.

"2. An uneventful recovery after so many operations in the case of a woman seventy-one years of age, with a subsequent gain in weight, leads one to infer that age does not necessarily contra-indicate surgical measures for the relief of a deformity.

"On June 24, Dr. Lewis and Dr. Van Deesten assisting, I repaired the perineum and sphincter ani. Recovery was uneventful; wound healing by primary union.

"July 11.—Control very much improved.

"August 5.—I saw the patient this morning. Results excellent. She is able to help about the hospital. Sphincteric control improved, but far from perfect yet."

On December 3, 1913, we had occasion to operate at St. Mary's Hospital, in Hoboken. It is over four years since the case just related was operated on, and the Sister at the hospital told me that the woman has had no recurrence of her prolapse, and is in good condition.

Since performing this operation, we have operated on three cases of pronounced prolapse of the rectum alone, and have modified the technique so that it is a very much simpler and better operation. One case, the history of which is given below, was just as pronounced as the above. This patient was operated on about three years ago and is perfectly well at the present time:

Mrs. M. was referred to St. Bartholomew's Clinic for a

prolapse of the rectum. She said she was a cook and usually held good positions, but owing to this trouble she had not been able to work for over two years, and if she could get relief she would be able to regain her situation.

On examination I found a complete prolapse of six inches of the rectum, which I tried to replace, and succeeded in doing so; but the moment she stood up the prolapse recurred. She could only lie on her side, as sitting was impossible and when she worked the condition caused her a great deal of pain. I decided, therefore, to operate. The patient was willing, and readily consented to any measure that would afford her some relief.

This case demonstrates the possibility of doing this very bloody operation with the loss of no more blood, perhaps less, than usually occurs in the ordinary hemorrhoidal operation. As there had been a great deal of bleeding in the two previous cases, a very simple idea occurred to me to obviate it in this particular instance. After the patient was under the anesthetic the prolapse was pulled down as far as it would come and held in position by an assistant with T-forceps. After the bowel had been thoroughly irrigated with peroxide of hydrogen and alcohol the patient was put in an exaggerated lithotomy position. This was done in order to get the small intestine out of the anterior hernial sac. The bowel was then encircled with tape and tied about one-half inch from the mucocutaneous border. After this, the outside or proximate bowel was rapidly but carefully incised and the outer cuff pulled down over the inner. The inner cuff was then treated in the same manner. Afterward a careful search was made for the bloodvessels in the mesentery, and when found they were tied. Before proceeding further we cut the tape in order to find out if any bloodvessels had escaped and only two little spirters required tying. The rest of the operation resolved itself into a simple end-to-end anastomosis. Time occupied, thirty-five minutes.

The woman was out about ten days after the operation.

Colopexy.—This is an operation that has had quite a vogue. The bowel is fixed to the abdominal wall, or to the side of the pelvis, and is performed in the following manner:

The patient is prepared and anesthetized; median incision is

made, and the abdomen opened in the usual way. The self-retaining retractor is placed in position. The patient is then placed in the Trendelenburg position and the small intestines are lifted out of the pelvis and packed securely with a single towel wrung out of a warm saline solution. The pelvic colon is now drawn up until the prolapse is entirely reduced. An incision of about two and one-half inches long is made through the pelvic peritoneum parallel to but outside of the left ureter. The cut edges of the peritoneum are raised so that the iliac fascia is exposed. Two or three Pagenstecher sutures are put through the longitutinal muscular band and afterward through the iliac fascia and all sutures tied, thus holding the bowel in position. The peritoneum is next attached to the gut by a few interrupted sutures. This is Ball's operation and he has performed it five times. One case died of pulmonary tuberculosis while sitting up on the tenth day after the operation. All the others have been cured.

It is an excellent operation, except that it is open to the same criticism that applies to all "pexies"—that it is anatomically incorrect.

However, after a very extensive experience extending over many years in association with the late Dr. Tuttle and in my own practice, I have come to the conclusion that this operation very often gives satisfactory results in certain cases. These are cases of intussusception, especially where intussusception does not extend outside of the anus. Another operation which is frequently performed is that of attaching the pelvic colon to the transversalis fascia.

Another operation, and one that found great favor with the late Professor Tuttle, is somewhat similar to the Ball operation except that the colon is fixed to the abdominal wall instead of to the side of the pelvis. The abdomen is opened by median incision and a self-retaining retractor holds the wound open and allows free access to the abdominal cavity by the operator. An incision is made in the peritoneum about an inch from the median incision and at about an angle of forty-five degrees from the original incision and should be about three inches long. The peritoneum is peeled back slightly and the transversalis

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fascia is exposed.   Two or three Pagenstecher sutures are passed through the longitudinal muscular bands of the bowel and then through the transversalis fascia, and in this way the bowel is held in position.   The peritoneum is afterward closed around the bowel as far as possible and the abdomen is closed in the usual manner.

Peters' operation is based on the supposition that the prolapse originates as an intussusception and the abdomen is opened by median incision and the prolapse is reduced; then a number of sutures are placed in the anterior surface of the rectum so that when closed they cause a slight enfolding of the bowel.   Any operation that diminishes the lumen of the bowel in this region is apt to result seriously, for some reason or other.   There is a tendency to spasm and stricture at the peritoneal reflection; consequently any operation that encroaches on the lumen should not be considered seriously.

VENEREAL DISEASES OF THE ANUS AND RECTUM.

UP to ten or fifteen years ago, venereal diseases of the anus and rectum were considered comparatively rare in this country. This assumption, however, was more apparent than real, and we doubt very much if, in proportion to the population, these diseases were any rarer then than now. Of course, with the rapid increase of population, prostitution and other vices have increased in the same ratio, so that at the present time these diseases are naturally more prevalent than they were twenty years ago. The principal venereal diseases which attack the rectum and anus are gonorrhea, chaneroids, and syphilis.

Gonorrhea.—Gonorrheal proctitis, while not very common, is seen quite frequently in the large clinics devoted to this specialty. A great many cases of proctitis are of gonorrheal origin, but, when seen in the late stages, the organism cannot be found, and while the cases have all the clinical manifestations of an old gonorrheal infection, they cannot be classed under this heading unless the gonococcus is demonstrable. Sometimes the disease is contracted innocently, especially in clinics where a large number of patients are treated for prostatic disease, when through carelessness, or by means of a soiled finger or glove, the organism is introduced into the rectum. This disease is rather common among those who practise pederasty and sodomy. Curious as it may seem, the disease is rarely found in women suffering from gonorrheal vaginitis, even though the discharge is profuse. The writer, many years ago, was gynecologist to one of the large clinics where he had an opportunity of examining twenty-five women daily, on an average, and he rarely found a case of gonorrheal proctitis.

Bonnier was the first to demonstrate the fact that the introduction of the gonococci into the rectum produced an inflammation.

The discharge from the eyes of a woman suffering from urethral and conjunctival gonorrhea was introduced into the rectum with positive results.

V. Bandler, in 1898, reported the case of a suppurative periproctitis of gonorrheal origin. When the abscess was first examined, only streptococci and staphylococci were found, but on a later examination the gonococci were discovered. He believes that a secondary infection with streptococci and staphylococci can, and usually does, take place; then there will be a severe pus infection, which does not predominate in clean gonococci cases. In thirty cases which were collected by Bandler, ten were due to coitus and twenty to an infection from pus of a vulvovaginal abscess. The same writer believes that together with rectal gonorrhea we see inflammation in the form of rhagades and elliptical boat-like sores in the anal folds. He is inclined to believe, also, that the ulcerations are not due to gonorrheal infection alone, but to other factors, and so far as he can learn, the gonoccoci have not been demonstrated in those very deep ulcerations.

Rona has reported the cases of two women with rectal gonorrhea; in one, besides urethral, cervical and rectal gonorrhea, there was also a fistula in which the gonococci were present.

Alfred Huber believes that we see more cases of rectal gonorrhea now than formerly, because we are not satisfied with the statements of patients, but look for the gonococci. He is of the opinion that subacute and very often acute rectal gonorrhea does not give rise to subjective complaints, and it is sometimes accompanied by such slight symptoms as to be frequently overlooked. He also believes with Baer that gonorrheal proctitis is a very common disease among prostitutes. In eight months, he examined 533 patients, all prostitutes; of these 318, or 59.6 per cent., were found to have vaginal gonorrhea. In 78 of these 318, or 24.5 per cent., he found rectal gonorrhea also. In 14.8 per cent. of all venereal diseases collected by Huber, gonorrheal proctitis existed. He also says that the coexistence of a gonorrheal inflammation, not only of the anus but also of the rectum, is absolutely proved, the gonococcus being found in the glandular and periglandular tissue. The microbes pass through the mucous

membrane up to the tunica muscularis. In another case he found the same picture but did not isolate the gonococci; there were present some tubercles without the bacilli. This case was therefore doubtful.

Rollet reported a case in which infection occurred in a patient who suffered from a urethral discharge; he introduced his finger into the rectum in order to produce a movement of the bowels. The finger was evidently infected with the discharge, and in this way the mucous membrane of the rectum became inoculated. The writer has had several cases where the mode of infection was similar. We are all aware that gonorrhea is often associated with constipation, and it can easily be seen how in these patients a direct infection can take place.

Symptoms.—The first symptom is usually a sense of fullness, with a desire to strain. This is followed by severe burning and dull, aching pain, followed by a discharge of mucus mixed with pus and sometimes blood. Any movement, such as walking, standing or exercising in any way, also violent coughing, is very distressing to these patients. After a while, when the disease is well developed, great pain is experienced at every movement, so much so that, as a general rule, they become very much constipated. On account of the severe pain, distress and heaviness which are constantly before them, they sleep but little, and consequently, after a while, lose weight and become very much run down and depressed. On account of the discharge from the anus, the skin becomes macerated and a severe erythema adds to the discomfort and makes it impossible for the patient to remain in any position but the recumbent one.

Diagnosis.—To one accustomed to treating these cases, a diagnosis can be made at a glance. In the last ten years the author has seen about 100 cases of this disease, and in no instance has it extended more than three or four inches above the anus, and this in cases that have been neglected; that is, where the patients do not follow up the treatment. Some observers claim that it invades the entire colon. Pennington, of Chicago, reported a case before the American Proctologic Society in which the entire colon was involved. This does not coincide with our experience. Of course, it can be readily seen that a gonorrheal proctitis, with

ulceration, may be the starting-point of a severe infection; but that the gonococcus is the cause of that infection is open to question. An ulceration once established becomes the stamping-ground for all the bacteria that inhabit the intestinal tract. The colon bacillus, which predominates in most cases, would be very apt to continue the infection of the streptococcus or staphylococcus, or any other organism. We have seen cases where a gonorrheal proctitis was followed by a severe proctitis and sigmoiditis, but the gonococcus could not be demonstrated. Examination of the feces for the gonococci should always be made.

In gonorrheal proctitis the anus has a rather typical appearance. Where the disease is acquired innocently, especially from massage of the prostate, the sphincter is spasmodically contracted and the mucocutaneous membrane is red; but after the disease as existed for some days, the skin becomes macerated, and is covered by a mucopurulent discharge. In the case of sexual perverts, the skin around the anus is thrown into edematous folds. It has a cyanotic or bluish-red appearance, and is covered by mucus mixed with pus. In some cases the mucous membrane is prolapsed, and it is with difficulty that the speculum can be passed very high. Here and there we see flakes of mucus and pus resembling those of a severe peritonitis. The flakes are adherent to the mucous membrane, and when removed, leave a raw, bleeding surface. The mucous membrane in all cases bleeds very easily.

In syphilis, the condylomata lata are pearly gray, flat, and are seen just elevated above the skin; whereas the gonorrheal vegetations or condylomata acuminata grow out and reach an enormous size, forming excrescences which are of a pale reddish appearance and do not in any way resemble the syphilitic condylomata. The condylomata acuminata are very exuberant, watery growths. Gonorrheal warts are not necessarily of venereal origin, but are usually due to moisture and local irritation. The gonorrheal warts originate in the papules, and are really papillary outgrowths and occur most frequently at the junction of the skin with the mucous membrane.

Complications.—Of course, in this, as in any other infection, an abscess may result, the location depending upon the site of the

ulceration. In the experience of the writer, edematous external piles are the most frequent complication. According to Neuberger, Forster, Volkmann, Schuckhardt, Ponfick, Delbert, Bieck, and Brendt, strictures of the rectum result from gonorrheal proctitis. According to Forster, the pathological changes are as follows: first, ulceration of the mucous membrane, then a gradual disappearance of the cellular layer, followed by gradual contraction. In 161 cases of gonorrhea that came under Baer's observation he found rectal gonorrhea in 67; and in 770 women with venereal diseases, of whom 429 had vaginal gonorrhea, and 163 had also a gonorrheal proctitis. Among these 163 there was one case of stricture. In 440 cases of gonorrhea observed by Bieck, the infection was localized in the colon in 42 cases, and in 32 of these the rectum and colon were involved, and in 10 cases the trouble went even higher.

Fistula, condylomata and fissure sometimes complicate the condition. So far as the writer has observed, the disease is more limited if the proper treatment is given. It must be remembered, however, that only a small percentage of cases are seen by the physician, and when seen, are usually treated for other conditions, and outside of clinics devoted to these diseases, a thorough examination is rarely made. The writer does not believe that the gonococcus is responsible for a stricture, but the latter is caused in the majority of cases by a mixed infection following gonorrheal proctitis.

Treatment.—A recurrent catheter should be passed beyond the internal sphincter, and with the patient in the Sims or lithotomy position, the rectum should be irrigated with a saline solution, at a temperature of 110° F. This should be continued for at least twenty minutes, and repeated two or three times a day. After the saline irrigation, the rectum is washed out with a small quantity of warm sterile water, and when all the water has drained out, the return catheter is clamped and through the inlet a few drams of a 40 per cent. solution of argyrol are injected. The catheter is removed, and the patient instructed to retain the fluid as long as possible.

If the pain, fullness and tenesmus are distressing, a suppository containing opium and belladonna should be inserted, the parts

kept absolutely clean, and the skin adjacent dusted with stearate of zinc, or some other powder, in order to prevent chafing. After this, a piece of cotton should be placed between the buttocks in order to absorb the discharge and prevent the parts from rubbing together. When the acute symptoms have subsided, a speculum should be introduced after the usual irrigation, and the parts painted with some preparation of silver. Great care should be taken not to injure the mucous membrane while inserting the speculum.

Chancroid of the Anus.—This is not at all a common disease, and when it does occur it is usually found in people of uncleanly habits. In the writer's clinic it is usually found in prostitutes and persons of a low order of intelligence, and is more prevalent among women than men. In Fournier's practice, this disease occurred once in 445 men, and once in 9 women, suffering from venereal diseases. Other investigators have, in a measure, corroborated the findings of Fournier.

In a great many cases chancroids of the anus are secondary to chancroids elsewhere, and are usually limited to the anal and perianal regions, especially where the buttocks approximate. If they become phagedenic, great destruction of tissue may result.

Etiology.—It is now generally conceded that chancroids are due to an infection with a specific microörganism (Ducrey's bacillus).

Appearance.—The chancroid usually begins as a small pustule surrounded by a raised red areola. The pustule ruptures and leaves a small oval cup-shaped ulcer, which spreads rapidly at the periphery. The edges of the ulcer are usually clean-cut and undermined; the base is uneven and covered with a grayish membrane of broken-down tissue. The discharge is foul-smelling, sour, abundant and purulent, and contains bacteria which are likely to infect other surfaces and set up a similar process. The duration of the chancroidal ulcer depends to a great extent on its early recognition and proper treatment. If the patient notices the condition in its early stage, and comes under proper treatment, the duration of the disease is generally short and destruction of tissue slight. But as these ulcers occur usually in persons of

low intelligence, it is not until the condition becomes unbearable that medical aid is sought. Therefore, in the majority of cases, the ulcerations are extensive and the treatment difficult. Associated with the ulceration there is a severe dermatitis. It is this dermatitis which, as a rule, brings the patient under the observation of a physician. The ulcers are generally multiple; rarely single.

The small ulcers sometimes coalesce, forming large, irregular ulcerations. The created *r* the ulcers is largely influenced by the approximation of the gluteal folds and by the length of time they have existed. When located in the anus, according to the conformation of the part, they are long, oval, or narrow. In the mucous membrane they appear as yellowish-gray fissures, and if it were not for the pain they produce, might easily be overlooked. They are distinguished from ordinary fissures by the presence of chancroids in other parts of the body, by the odor and abundance of the pus, and also by the fact that they are usually multiple. So far as pain is concerned there is very little difference between this form of ulceration and ordinary fissure, as in both cases the pain is intense. The onset is slow and the healing equally so.

Treatment.—The treatment of this condition is extremely difficult on account of the contraction of the sphincter muscle. When the chancroids are in the perianal region, treatment is much easier than when they are situated inside of the sphincter muscle. The drainage inside is imperfect on account of the spasm of the muscle; the chancroids are very inaccessible, and for this reason, except by dilatation under a local anesthetic, the treatment is extremely painful. Any radical measures might open up the lymphatics and bloodvessels and lead to a very serious infection; therefore, we should be slow to advocate such measures in this disease. It is much better, unless there is some contra-indication, to give the patient a local anesthetic like ethyl chloride and gradually stretch the muscle, at the same time applying a 2 per cent. solution of nitrate of silver to the ulcerated part. Occasionally the actual cautery is necessary in order to prevent the spread of the infection; this should also be applied under local anesthesia. Equal parts of carbolic acid and tincture of

iodine have been advocated, but this procedure is extremely painful. A method that has been followed by Dr. Bangs is to apply a soluble tablet of cocain, and afterward to touch the ulcers either with the actual cautery or with a solution of nitrate of silver. This should be applied at once, no matter what other treatment is used. When the ulcers are situated in the skin outside of the anus the treatment is comparatively simple. Washing the parts several times daily with warm water, thoroughly drying, and then applying one of the   ng solutions will be found very effective: Black wash (which is a solution of calomel and lime water), followed by a powder of calomel or oxide of zinc; or calomel and starch; starch alone occasionally gives the greatest relief. After this the patient should place pieces of cotton between the gluteal folds so that the parts do not rub together.

Dusting with iodoform, aristol or sulphocarbolate of zinc with ichthyol will in a short time cause an entire disappearance of the ulcers.

Chancroidal Ulcers of the Rectum. — Occasionally chancroidal ulcers will extend from the anus into the rectum. When this condition is primary in the rectum it is usually due to direct infection following the practice of sodomy. As a general rule, however, these ulcers rarely extend beyond the internal sphincter.

Symptoms.—There is usually diarrhea and a profuse discharge of pus mixed with blood. If the anus is not involved there is very little pain; but much pain is experienced when the anus is affected.

Treatment.—The treatment of this condition is similar to that given for an anal infection.

Phagedenic Chancroid.—Owing to constitutional conditions the chancroids may assume a type which is either acute or chronic. When this occurs there is great destruction of tissue, and the parts are swollen, edematous and painful. There is a rise of body temperature, with rapid pulse and dry tongue. The lymphatics in the neighborhood usually become involved and break down, causing metastatic abscesses in other parts of the body. When such a condition exists the actual cautery gives the most satisfactory results; at least this has been the writer's experience.

All other measures are merely palliative. Some surgeons have had very good results, however, by applications of the cautery after thoroughly scraping the granulations; but the writer has always found that the application of the cautery at the very beginning has been the most satisfactory.

Complications.—The complications are those that usually follow suppuration from any cause in this region; namely, abscesses, fistula, fissure, and occasionally stricture.

Syphilis.—Primaeated rnilis of the anus or rectum is extremely rare. The manifestations which we see in this region are usually secondary to syphilis in other parts of the body. When primary, it is usually due to unnatural practices, although accidental inoculation has occurred. The primary lesion is always a chancre, and in the experience of the writer, chancre of the anus differs from chancre in other parts of the body in that there is rarely that induration which one sees particularly in primary chancre of the penis; and its appearance is more like that of a fissure or a protrusion of the mucous membrane than anything else. These chancres are usually oval and of a cyanotic, reddish color, and in the anus become fissure-like as they extend into the mucous membrane. The writer had occasion to see one case very early after its occurrence, and had the patient under observation until the secondary syr   appeared.

When   glands in the groin were very much enlarged, and Dr. MacFarland of the laboratory removed some fluid from the glands and found spirochætæ. The chancre was elevated like a button, and the mucous membrane had grown down over the skin and was very raw and intensely red. As time went on, it began to shrink irregularly toward the inner side, the outer being still elevated. These shrunken ridges reached toward the anus and the color became a dusky red instead of a bright red, cyanotic in some places, and in others it was very pale, almost the color of the skin.

Primary chancre of the anus in men is nearly always evidence of the practice of sodomy. In women, one must always consider the possibility of infection from other sources, particularly as they are very often infected by their husbands, and not being

aware of this possibility, do not take the same precautionary measures that are adopted by public women.

The lesions may occur at any part of the anus or in the rectum, and perhaps more frequently in the former than the latter. As a rule, infection is due to an immediate contact, but it may occur through the medium of towels, sponges or syringes which have been used by people suffering from mucous patches either in the anus or other regions of the body. In one case reported by Tuttle, this disease was taken from an \ \ syringe which had been used by a relative with constitutional symptoms. Such an infection, is however, very rare.

Chancre may be complicated with chancroids, thus making the diagnosis difficult. The character of the chancre may be so changed by a mucous infection as to take on a phagedenic character and make the case difficult of diagnosis. The experience of the writer coincides entirely with that of Fournier, in that the cure of the local sores is very slow; in a case observed recently it took from seven to eight weeks, although the patient received most vigorous treatment.

The chancre is usually of a dark, cyanotic, reddish color, and has a glazed surface. When it begins to disappear, it gradually fades toward the periphery, and becomes smaller and smaller until entirely gone. Associated with \ | whether primary or secondary, we see hypertrophied ḥ and a profuse (In all cases where the anal and perianal tissue is involved the inguinal lymphatics are markedly enlarged, and the fact that this enlargement continues without breaking down is, of course, evidence in favor of syphilis.

With the facilities which we now have it is possible to make a diagnosis within a very short time. In a case recently seen by the writer, the *Spirochæta pallida* was found within a few hours, which is rather unusual. Subsequently the Wassermann reaction was positive, and the appearance of the secondary eruption a little less than four weeks after was also observed. In this case the patient did not receive treatment until after the appearance of the secondary eruption.

Symptoms.—There is acute pain following defecation, lasting about fifteen minutes and gradually subsiding. Itching, or

pruritus, is sometimes very severe, so much so that the patient finds it very difficult to sleep, and there is a discharge of muco-purulent or purulent secretion, with or without blood.

Treatment.—The treatment of the initial lesion does not differ from treatment of the same condition in other parts of the body; consequently we will not go into details. Our patient was given salvarsan, followed by vigorous mercurial inunctions. The general health of the patient should be considered, of course, and the patient treated rather than the disease.

Fig. 118
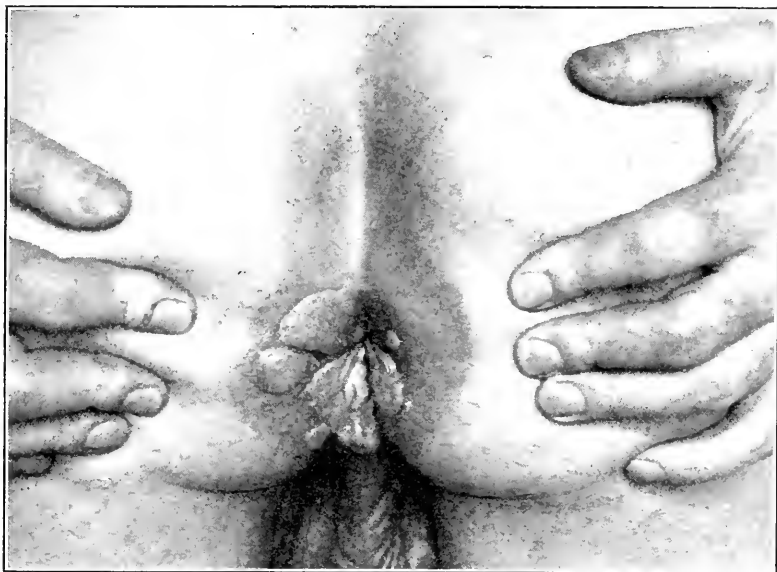
Mucous patches. Flat condylomata, syphilitic. (Lynch.)

Mucous Patches.—These are frequently found in and around the anus and are due to the constant moisture and the rubbing together of the nates. The patches are found more often in women than in men, and extend from the vagina to the rectum, are grayish white in color, and are known as condylomata.

Gummata.—These lesions are seen more frequently in the rectum than in the anus. Fournier has never seen a gumma of the anus; such cases have been reported, however, by Mollière,

Verneuil, and others. They are usually multiple and assocated with infection, and can be felt as nodular tumors scattered over the bowels, and as round, elastic, painless tumors in the submucous tissue. Unless treatment is instituted they break down, leaving ulcers which usually result in infection of the bowel.

FIG. 119

Condylomata of the rectum in a small boy. (St. Bartholomew's Clinic.) (Lynch.)

Anorectal Syphiloma.—This condition is a hypertrophy of the skin and mucous membrane of the anal and perianal tissue. It is usually associated with skin tabs, and the entire mass is composed of unyielding fibrous tissue which sometimes obliterates the anal opening. The perianal skin is thrown into folds, so that a number of ears of hypertrophied skin surround the anus. The anal mucous membrane is almost entirely destroyed, and the

appearance is that of the hypertrophied skin which has grown into and invaded the mucous membrane. On examination it gives the impression of a very dense and unyielding mass of fibrous tissue.

FIG. 120
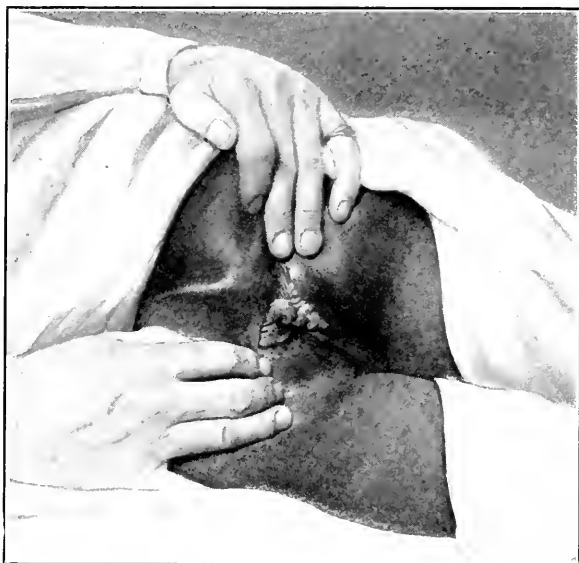
Syphiloma of the anus. (Lynch.)

Treatment.—The treatment which has been adopted by the writer consists in dissecting away this hypertrophied skin and bringing down the mucous membrane—practically a modified Whitehead operation—then putting the patient on a vigorous antisyphilitic treatment.

CHAPTER XV.

RUPTURE, INJURIES AND WOUNDS OF THE RECTUM.

THE rectum, on account of its anatomical relationship to the bony wall of the pelvis, its ligamentous support, and the muscular padding on either side, permits of considerable traumatism, and under ordinary circumstances is not easily ruptured. However, under pathological conditions rupture may easily take place. There are several cases on record where rupture of the normal rectum has occurred, due to the insertion of foreign bodies or inflation with gas. Several cases have been reported where rupture has followed the passing of the proctoscope. Of course this should never happen when proper precautions are observed, and the physician or surgeon has even the most rudimentary knowledge of proctoscopy. In most cases rupture is due to forcing the proctoscope up into the bowel blindly, and with no sense of direction. This is specially true when the rectosigmoidal juncture is reached, and it is at this point that most of the ruptures take place.

As is well known, the sigmoid leaves the rectum to the right or left at a rather acute angle. The opening in a great many subjects is covered by the valve, and when this portion of the bowel is reached, some difficulty may be experienced in finding the rectosigmoidal opening, if one is not familiar with proctoscopy. One case referred to the writer as a stricture of the rectum had a condition such as has been described. The physician who made the diagnosis tried to push the proctoscope forcibly through what he imagined to be the stricture. Fortunately he had placed the proctoscope against the wall of the rectum, which is in close proximity to the hollow of the sacrum, with the result that a large edematous tumor could be distinguished in this location. Now, if instead of passing the instrument back, as the physician

did on this occasion, he had pressed it forward, he would have undoubtedly ruptured the rectum. An examination of this case showed the rectum and sigmoid to be prefectly normal except for a rather acute angulation and the fact that the recto-sigmoidal opening was covered by the valve.

When the rectum is diseased, as in the case of stricture, ulceration, and chronic inflammation with ulceration, instrumentation may very easily result in rupture of the rectum. Perhaps the most frequent cause is forcible dilatation of a stricture with some mechanical appliance. Under these circumstances the tear occurs in the long axis of the gut, and nearly always involves the peritoneum, with subsequent infection and peritonitis. The greatest care should always be exercised in the dilatation of strictures; and mechanical appliances, such as steel instruments, Barnes's bag, or any instrument that has for its object the forcible dilatation of the rectum, should be avoided.

The writer has seen three cases where rupture of the rectum followed the use of instrumentation for the dilatation of a stricture. In the first case, a Barnes bag was used; in the second case a metal dilator had been employed on the principle of a uterine dilator; in the third case the patient was suffering from a malignant growth in the rectum, and during operation on this growth the rectum was perforated and a considerable quantity of fluid passed into the peritoneal cavity before the rupture was discovered. The writer was present when this accident happened. All of these cases recovered.

Many cases are on record where the nozzle of a fountain syringe had been forced through the ~~~~ ~~~~~ . This can be readily accounted for by the fact that two inches from the anus the bowel is almost entirely devoid of sensation, and can be perforated without causing any symptoms at the time.

A case of spontaneous rupture is reported by Heincke[1] in which an apparently healthy man, aged thirty years, while trying to life a piece of iron with the body bent forward, experienced great pain and vomiting. When admitted to the hospital, it was found that the rectum had been ruptured. At operation, the lesion

[1] La Semaine Médicale, Sept. 12, 1906.

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was not discovered, and it was only at the autopsy, two days later, that a linear tear was found in the side of the rectum.

Tuttle has reported a case of extra-uterine pregnancy, in which the fetus ruptured into the rectum and passed out.

The sigmoid is not as well protected as the rectum, and consequently is probably injured more frequently than the latter organ. In a great many cases where the rectum is ruptured, the sigmoid is also involved, so that it is pretty hard to draw the line between these two parts of the intestine. In the three cases mentioned above the sigmoid was involved.

A very interesting case of rupture of the sigmoid, which also involved the parietal peritoneum and the cecum, was recently reported by Dr. Morrow, of the Clinical Society, at the New York Polyclinic Hospital. The patient, while coupling two freight cars, was caught between the buffers. The rectus muscle on one side was ruptured; the parietal peritoneum was torn across; the cecum was torn from its attachments for three inches; there was a very large rent in the bladder and also a rent in the sigmoid. This patient made a very good recovery.

The sigmoid and rectum are frequently ruptured during operation on the uterus and adnexa. Pus tubes occasionally rupture into the sigmoid or rectum.

Spontaneous rupture of the sigmoid, when that organ has been previously diseased, has been reported. It occasionally occurs following diverticulitis; also, following an acute ulcerative colitis.

The prognosis in all these cases depends largely on the resistance of the individual; the a the valve, aal matter in the bowel at the time of the rupture; the intestinal flora of the individual, and also, to a great extent, on the early discovery of such wounds, injuries or ruptures. An auto-intoxicated person with a low resistance, and especially one in whom the colon bacillus is active, will stand a very poor chance of recovery following a perforation of the rectum or sigmoid. As a rule, however, where the injury has been recognized early, results after operation have been very good. In one case where the writer was present at the time the rupture occurred, and where a quantity of fluid was injected into the peritoneal cavity, the patient made an uneventful

recovery. In the second and third cases referred to above the patients also made a good recovery. Ruptures were discovered very early, and proper measures taken at once to repair the damage, with the establishment of good drainage.

The involvement of neighboring organs will, to a great extent, influence the prognosis; particularly the involvement of the bladder. As a general rule, when the bladder is involved, the prognosis is grave; yet cases have been reported, and the writer knows personally of one, where there was considerable leakage of urine into the peritoneal cavity, which was followed by an uninterrupted recovery after the injury was repaired. A case has been reported where the bladder was ruptured and the urine flowed freely into the peritoneal cavity for several days; yet the patient recovered. These recoveries, however, must be considered rather the exception than the rule, because statistics in general show the mortality to be very high where the bladder is involved.

Sims[1] reported seven cases of gunshot wounds involving the rectum, bladder and peritoneum, in which recovery took place in every instance. Reports from our Civil War, however, and those from the Franco-Prussian War show a mortality of 40 per cent. (*Medical and Surgical History of the War of the Rebellion.*) Infection with infiltration and diffuse cellulitis with secondary hemorrhage were very serious complications in those cases. But one can hardly draw conclusions from surgical lesions that occurred in the early sixties, as abdominal surgery at that time was in rather an embryonic stage; so that a mortality of 40 per cent. should not be considered an unfavorable showing. If those cases occurred at the present day, the mortality would undoubtedly be considerably reduced.

Van Hook reports 58 cases of injury to the rectum, 28 of which were complicated by injury to the peritoneum.[2] Of these 26 cases 20 died, a mortality of about 80 per cent.; but it must be remembered in connection with these cases that the operations were performed at a very late period, and after the peritoneum

[1] British Medical Journal, February 18, 1882.
[2] Monthly Journal of Medicine and Surgery, June, 1896.

had become seriously involved. On the other hand, in the 30 cases where the peritoneum was not involved all recovered.

Primary or secondary hemorrhage would seem to the writer to be the most serious complication, as the bloodvessels in this vicinity are very large, and the patient would become seriously exsanguinated before surgical help could be obtained.

At the present time, however, with injuries such as have been described, with immediate surgical attention, good drainage (the patient in a sitting position, and with a Murphy drip) the results should be very favorable.

Symptoms.—Severe pain, followed by shock with or without hemorrhage, and chills would indicate clearly that the bowel had been ruptured. In the cases seen by the writer, pain was the most pronounced symptom; afterward, shock. The subsequent history is that of a peritonitis with all its attendant symptoms.

Treatment.—The treatment of rupture and injury to the rectum, sigmoid, or colon depends, to a great extent, on the site of the injury, its proximity to the peritoneum in the rectum, and in the case of the colon, the extent of the laceration.

In the case of the rectum, drainage should be established immediately. This, in a great many cases, will be sufficient for the time being, until the patient is in a better condition, and shock has been overcome.

The treatment of injuries to the sigmoid and colon require immediate laparotomy, repairing the laceration, and putting in a drain. In the case of the latter, the surgeon should follow the dictum o.' getting in as quick as possible and getting out faster.

THE colon, or large intestine, is that specialized part of the intestinal canal concerned in the formation and evacuation of feces. It has other physiological functions, but they are of minor importance.

The colon *begins* in a dilated pouch, the cecum; and *ends* in a dilated pouch, the rectum. Its entrance is guarded by an automatic valve, the iliocecal; its exit by a valve under the control of the will, the anal sphincter. It is widest at the cecum and narrowest at its junction with the rectum. Four anatomical angulations give this organ potent pathological possibilities.

Dissected free from the other organs and its angles turned into curves, the colon forms an incomplete circle, the gap being on the right side of the pelvis between the cecum and rectum. In the normal position, however, it forms a square, incomplete in the pelvis, enclosing the small intestines very much like a frame around a bas-relief. Three features distinguish the large from the small intestine. They are (*a*) the teniæ coli, (*b*) the appendices epiploicæ and (*c*) the colonic saccules. The *teniæ coli* are longitudinal muscular bands, and are a structural conversion from the longitudinal muscular layer of the small intestine. There are three of them, all beginning at the base of the appendix and arranged, one anteriorly and two posteriorly. In length they are about one-sixth shorter than the colon, and because of their disposition the posterior bands are denominated *postero-internal* and *postero-external* respectively.

A characteristic change in the course of these fibers occurs in the transverse colon and rectum. That, however, will be taken up in connection with these structures.

The *appendices epiploicæ* are small pouches of   on-taining tabs of fat. They are found throughout its course,

principally along the anterior bundle of the teniæ coli, and project from the serous coat of the colon. They are very much diminished in size or absent in emaciated subjects. According to Cunningham, the appendices epiploicæ can be distinctly seen as early as the seventh month.

The *colonic saccules* are pouches in the wall of the colon, and are produced by the ine͞ great help could h between the teniæ and the other coats of the intestine. however, with in if the teniæ are dissected away the sacculation disappears.

Fundamentally the structure of the large intestine is much the same as that of the small intestine. The chief points of difference are the presence of the teniæ coli and the absence of villi in the large intestine. The peritoneum invests it completely in its transeverse and pelvic divisions. The cecum, too, is almost always invested by peritoneum. The ascending, descending and rectal divisions are only partly ensheathed in peritoneum.

Its mucous surface is smooth and of a pale color. It becomes redder as the rectum is approached where it takes on special characteristics which will be described in connection with that region.

Apropos of the mucous membrane of the colon, the ileocecal valve is a subject of considerable interest.

Primarily the ileocecal valve is a slit-like opening, with two protuberant lips which proj͞ t into the lumen of the colon at its juries inner and posterior border and at the upper border of the cecum. It is composed of all but the serous and longitudinal muscular coats of the intestines. Its direction is anteroposteriorly, and it is a little over 1 cm. in length. Its two surfaces are different; for the one looking toward the ileum is covered with villi, whereas the one toward the colon resembles more the mucous membrane of that structure. The mechanism of this valve depends on two characteristics, first the direction of the ileocolonic junction, which is rather an obtuse angle, and second, upon the fact that when the cecum is distended it tends naturally to put the frenulum on the stretch and thus shut off its lumen. To locate this point on the body surface, draw a line from the highest point of ͢ ͢ ͢ crest to the other. Draw another line upward from the mid-point of Poupart's ligament on the right side. The

intersection of these two lines marks the normal location of the ileocecal valve.

By reason of its peritoneal attachments and arrangements the colon is divided into the cecum, ascending, transverse and descending, iliac, pelvic, and rectal colon. The individual parts, while they have a good many features in common, still present enough anatomical, surgical, and pathological differences to be considered separately. Also the physiology of the colon is not the same in all of its parts.

Primarily the cecum is a blind pouch. Into it open two orifices. One of these is from a blind tube; the appendix; the other is the ileocecal orifice from the small intestine. It is the first region of reception of the contents from the small intestine and the last point in the colon to check backward pressure of fecal contents. Besides, it hangs free and is capable of enormous distention. Thus it becomes a centre of surgical, anatomical, physiological and pathological interest. When distended to the point of bursting, and left attached to its mesentery, it is seen to be an unsymmetrical pouch, curving over internally; on its anterior surface it is made tense by the anterior tenia coli; and is longer at its antero-external surface and external border.

CHAPTER XVII.

MALDEVELOPMENT OF THE COLON.

Non-rotation of Colon, or Left-sided Colon.—Failure of the colon to rotate, which usually happens about the seventh week of fetal life, is rather unusual. Rotation or flopping takes place at such an early stage that very often the abdominal viscera accommodate themselves to the unusual situation, so that after birth there is little disturbance of digestion. The patient may go through life and the condition be discovered only at the autopsy in cases which find their way into the dissecting room. We must naturally assume that this is so, on account of the number of abnormalities discovered after death in adults and people of middle age. It may be that it is overlooked in a great many cases owing to the fact that there are few symptoms, or because of failure on the part of the physician to have the patient x-rayed.

For two cases I am indebted to my friends, Drs. Satterlee and Weinstein; the history of each case will be given later on.

Symptoms.—Usually at some time during their lives the patients suffer from indigestion, and it is this symptom that brings them to the physician. This is probably due to failure of the colon to empty itself and its freedom of motion. In one case (Dr. Satterlee's) we are inclined to believe that the stomach symptoms were due to flopping of the colon to the right side when full, causing pressure on the duodenum, or obstructing the small intestine. Constipation is usually present, and it is only after failure of drugs and enemas that those cases resort to a physician. Fig. 121, which is an x-ray taken by Dr. Le Wald, shows the condition very well.

This case is a male patient who was seen by many physicians before he fell into the hands of Dr. Satterlee. A diagnosis was made of chronic gastritis with probably cancer of the pylorus.

He is fifty years old; his mother died of consumption, and his father at fifty had stomach trouble. He is the twelfth of thirteen children and was born prematurely. He has always been a

Fig. 121

Non-rotation of the colon. (Satterlee.)

hearty eater and lived an active out-of-door life. He drank alcohol in moderation; never touched tobacco. Up to a few years ago he was perfectly healthy, and his bowels moved freely

once a day. For the last few years he has suffered from dyspepsia, sick headaches and flatulence, frequent nausea, and occasional vomiting. Examination of stomach showed absent hydrochloric acid; there were no other symptoms. For this condition the patient was put on a milk diet. After he had been on the diet for a while he lost twenty-six pounds. Occasionally he feels well, but as a general rule he is nauseated, suffers from gas, and sometimes vomits. He feels well after eating but a glass of water will cause nausea.

Examination.—Somewhat pale. Abdomen soft. Liver can just be felt. Stomach can be felt below umbilicus. His right kidney is movable. Abdominal muscles are somewhat lax. Shows some emaciation. Rectum normal. Reflexes exaggerated. The patient was fitted with an abdominal support and has since been comfortable.

Treatment.—If the patient is uncomfortable and not relieved by an abdominal belt, as in Dr. Satterlee's case, then it would seem wise to consider surgical measures. This patient is evidently suffering from auto-intoxication, and we believe sooner or later will require surgical procedure for the relief of his symptom.

Surgical Treatment.—Anastomosis of the sigmoid and the ileum should first be considered, and if this does not give relief more radical measures should be considered. Removal of the colon would be comparatively simple in a non-rotated colon. Both this and the previous procedure are described elsewhere (see page 527).

Megacolon.—Megacolon is a congenital overdevelopment of the colon which becomes more exaggerated as the responsibilities of life outside the uterus are assumed. As a general rule redundancy of the colon is very apt to manifest itself early in life, on account of its capacity for mobility and its tendency to angulate or twist on its axis. It has been described from time to time by different writers, but like many other conditions it is often overlooked. Parry first described it in 1825, but it wasn't until Hirschsprung's article appeared that the medical profession recognized its importance. Since then the colon has come into prominence by the writings of Tuttle, Lane, and others. Many cases have been reported, and at the present time it is seldom

overlooked. The writer has seen three cases within the last few years; and one in particular, associated with other deformities, will be described later.

It is evident from the recorded cases and from the writer's experience that this malformation is of embryonic origin. The colon is overdeveloped and elongated, and as a result of angulation there is accumulation of feces and gas, and the musculature responds by hypertrophy and increased blood-supply; in some cases the opposite takes place, and the colon or sigmoid becomes filled with gas and the musculature attenuated as the result of overdistention.

Symptoms.—The symptoms which usually attract attention are constipation, distention, and colicky pain. Sometimes the child is born with an enormously distended abdomen, which later on is relieved by a movement. It is interesting to watch these cases. The abdomen swells up until it is absolutely tense, and after a movement it flattens out like a punctured balloon. In other cases there is very little pain or distention, but there is gradual loss of appetite, drowsiness and loss of weight. The colon fills with feces until the abdomen is so prominent that it looks exactly like a tumor. Sometimes the bowels do not move for several days or weeks, until the child complains; then it is given a cathartic and enemas and the fecal mass is gradually removed. After this the patient is well for a period, and the appetite is good until the feces accumulate again. As a general rule the picture in children is rather characteristic. The distention is abnormally great; the skin is dry, the face is pinched and wrinkled from pain; the child cries periodically; the veins of the abdomen are sometimes distended; the legs are flexed on the abdomen to relieve nervous tension; sometimes the abdominal wall is very thin and peristaltic waves can sometimes be observed. Diastasis of the recti muscles may be present. One of the striking features, as observed by Finney, is the change that takes place in the costal angle and plane of the chest wall. The former is rendered very wide and obtuse; the latter, instead of its normal and practically vertical position, as a result of the continuous pushing up of the diaphragm by the distended intestines becomes at times almost horizontal.

In one of my own cases the distention was central and gradually

sloped toward the sides; in another the abdomen was uniformly
distended and bulged out at the sides.

The feces are sometimes very dry, at other times very soft,
and have a marked odor.

Fig. 122
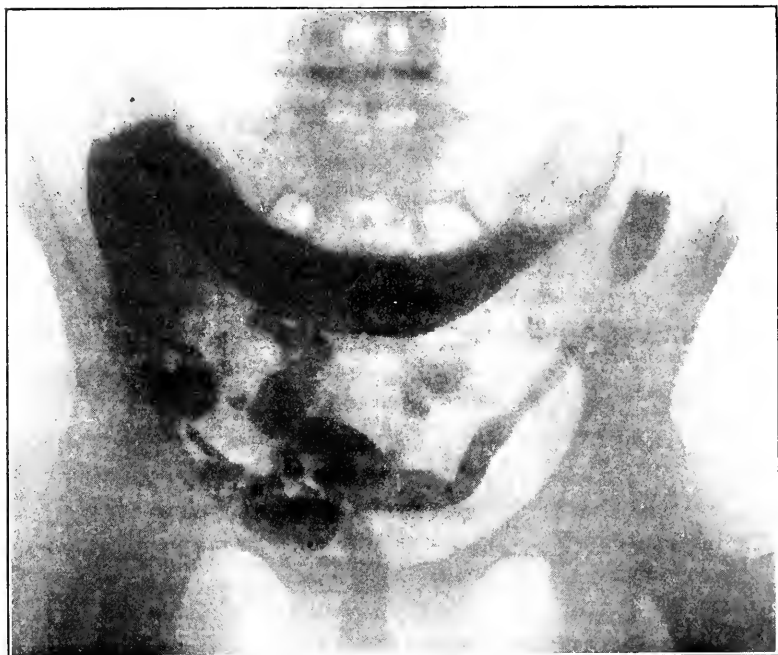
Case of microcolon.   (Satterlee.)

Diagnosis.—The diagnosis can usually be suspected from the
history, abdominal distention and pain, or by feeling a tumor
composed of irregular masses. The diagnosis can readily be con-
firmed by an *x*-ray.

Prognosis.—The prognosis is always doubtful, as at any time
perforation, rupture, volvulus, or acute intestinal obstruction
may supervene. Besides, it is difficult to bring up these children
on account of the constant pain, difficulty in feeding, and keeping
the bowels open. In one of the writer's cases it took three days
of vigorous washing, at intervals, together with castor oil, to
unload the bowel. The usual site of the trouble is the sigmoid,
or transverse colon. Naturally the cecum sooner or later becomes

implicated. The rectum is rarely involved, but may be the seat of inflammation or ulceration on account of the impaction. The rectum is sometimes ballooned and feels as if it were pasted to the side of the pelvis.

Treatment.—The treatment of a megacolon should at first be palliative. If this is not effective we must proceed to operative measures.

The palliative treatment consists in irrigation of the bowel to prevent the accumulation of fecal matter and gas. At the same time cathartics should be administered as irrigation alone is not effectual. Large doses of Russian mineral oil, $\frac{1}{2}$ ounce to 1 ounce, half an hour before each meal, will be of undoubted benefit in conjunction with occasional irrigations.

But should this treatment not accomplish all that is desired, or should volvulus or kinking threaten the patient with intestinal obstruction, no time should be lost in bringing him to operation.

Again, there are cases where the wall of the bowel is so attenuated as to render irrigation dangerous. Here we have no resource except operation.

We cannot lay down any hard-and-fast rule for the treatment of this disease; therefore the physician or surgeon must be entirely guided by the conditions that confront him.

It is now agreed by those most competent to judge that short-circuiting, in some form or other, offers the best hope for the patient's future, before resort to the more radical operation of removal of the colon. By this measure the patient is put in the best possible condition to withstand a major operation, if that should become necessary, on account of imperfect drainage of the excluded loop.

The short-circuiting operations that have been found most satisfactory are ileosigmoidostomy close to the rectum, and cecosigmoidostomy. After an experience with five cases of the latter we are convinced that ileosigmoidostomy is the better procedure. If the writer's modification of Lane's operation for short-circuiting is adopted it will considerably diminish the shock and simplify the technique. For a description of both operations see page 523.

Colectomy is also described in Chapter XXIX.

DYSENTERY.

Amebic Dysentery.—Previous to the Spanish-American War amebic infection was considered a disease of the tropics, and, so far as this zone was concerned, it was thought to be so rare that we never looked for this organism in diarrheal conditions unless the patient had dwelt in an equatorial country. Suspicion never rested on those who had passed all their days here. I now call to mind several cases of intractable diarrhea that were undoubtedly cases of amebic infection. There was one case in particular that would not yield to any internal medication, the patient dying after a four months' seizure. Since the Spanish-American War, however, we have been brought face to face with the fact that amebic dysentery is not confined to the tropics, and that some of the worst infections we encounter occur in individuals who have never been outside of the temperate zone.

The author has reported elsewhere an epidemic that occurred in the Syrian colony, the source of which was traced to a grocery store kept by a member of that race and frequented by Syrians from all over the country when visiting New York. Since then he has had several cases, both at the Cornell and at St. Bartholomew's Dispensaries, that have never been outside of the State of New York.

At the present time this disease is endemic in this country, and, so far as we can see from the reports of competent observers, it is steadily increasing. The question arises whether this affliction has always been endemic in this country, or whether it has been prevalent only since we assumed the mothering of foreign countries. This will be determined only by future investigations.

The Ameba.—Lösch, in 1875, was the first to describe the amebæ which inhabit the intestines of man. Since then various investigators have described the ameba of dysentery with some

differences of opinion as to its size, shape, and morphology. We can now see why such differences exist in the light of the researches of Craig and Schaudinn. In Craig's opinion, Schaudinn is the first author to contribute a clear description of the amebæ occurring in the human intestine both in health and disease; and to him we owe the establishment upon scientific grounds of two distinct species of amebæ. This has since been confirmed by Craig, and to anyone interested in this subject, both from a scientific and a historical stand-point, his paper can be recommended as well worth perusal. Until very recently it was not understood that there are two species of amebæ. I think most investigators are now in accord with Schaudinn. Cunningham, Massiutin, Grassi, Kartulis, Schuberg, Gasser, Strong, and Dock were able to demonstrate amebæ in the stools of healthy individuals, the percentage varying between 1 and 50 per cent. Schuberg's cases showed 50 per cent., Dock's only 1 per cent., and Schaudinn's 20 per cent.

Craig says: "My own investigations have been carried on in individuals free from disease and in those suffering from catarrhal conditions other than amebic dysentery and other diseases. The results obtained in the examination of feces in healthy individuals will first be given. These experiments were conducted largely upon members of the hospital corps, recruited from almost every portion of the United States, who were here on duty at the time. I made over 200 examinations in such cases, and have found that after administration of magnesium sulphate in ounce doses the feces of 65 per cent. showed the presence of *entamœba coli*. Thinking that geographic distribution might have something to do with the proportion of cases infected, I inquired into the locality from which the individuals came and endeavored to construct a table showing, if possible, any such variation; but I was unable to prove that the proportion of cases varied to any marked extent with the locality. This negative result cannot be considered as conclusive, for in many cases I could only examine the feces of one man in each locality. This question, in order to be settled definitely, will have to be investigated in different localities where large numbers of individuals can be examined under similar conditions. All of the persons examined were in robust health

and showed no evidence whatever of diarrhea or other intestinal disturbance. A large proportion of these individuals also presented mixed infections with *trichomonas* and *cercomonas intestinalis*. Many of them showed immense numbers of *entamœba coli* in the feces, while in others it required repeated examinations to demonstrate them. An examination of my own feces, after the administration of an ounce of magnesium sulphate, resulted in the demonstration of large numbers of *entamœba coli,* as well as *trichomanas intestinalis*."

From this we can see the importance of differentiating between the *entamœba coli* and the *entamœba dysenteriœ*.

An ameba is a nucleated mass of protoplasm capable of motion and reproduction. The *entamœba coli* differ in many respects from the *entamœba dysenteriœ*. The *entamœba coli* does not move as rapidly as the *entamœba dysenteriœ*.

The Size.—The *entamœba coli* varies from 2 to 25 microns, whereas the *entamœba dysenteriœ* varies between 15 and 50 microns. Of course the young *entamœba dysenteriœ* may be mistaken for the other form, but there are other distinguishing features which would enable anyone to differentiate between the two.

The Shape.—The *entamœba coli* is always spherical when resting, whereas the *entamœba dystenteriœ* may be spherical and very often oblong.

Color.—The *entamœba coli* is a grayish-white color, whereas the *entamœba dysenteriœ* is very often of a greenish shade on account of the hemoglobin which has been extracted from the red-blood cells that have been taken up by the ameba.

Protoplasm.—The difference in the ectoplasm serves to distinguish better than any other feature between the two forms of ameba. The ectoplasm in the *entomœba eoli* is less dense and less refractive than the ectoplasm of the other form. For this reason the *entamœba dysenteriœ* is capable of penetrating the mucous membrane of the bowel, whereas the *entamœba coli* is not, on account of the lesser density of the protoplasm and the smallness of the pseudopodia. The ectoplasm of the *amœba dysenteriœ* is coarsely granular and very reflective to light.

Another feature that distinguishes the *entamœba coli* from

the *entamœba dysenteriœ* is the number of red-blood cells that become engulfed in the latter. We have personally counted as many as sixteen blood cells in a single ameba. Craig says it is possible to see one or two blood cells in the *entamœba coli* but that he has never seen more than one or two in a single ameba. Now, as the diameter of a red-blood cell is about seven and one-half microns, one can readily see that an ameba containing sixteen red-blood cells must be of considerable size in order to accommodate so many.

Method of Reproduction.—The *entamœba dysenteriœ* and the *entamœba coli* reproduce by a simple division or by fission.

Etiology.—The principal etiological factor is, of course, the *amœba dysenteriœ*. The disease is usually acquired from eating raw vegetables or from drinking water that has been contaminated; or it may be directly transmitted from one patient to another through the use of cooking utensils.

There are certain intestinal parasites which are necessary to the existence of the amebæ and are always found in the stools of patients infected with this disease.

Pathology.—The organisms penetrate the mucous membrane and find their way into the submucosa, carrying with them the organisms which are necessary to their existence. They sometimes enter the capillaries and cause necrosis by blocking the terminal bloodvessels, or they may set up an active inflammation. The mucous membrane is edematous, infiltrated with round cells; the goblet cells are increased in number and all the glands are in a state of hypersecretion. The first evidence of inflammation is a papule; this papule has on its summit a little vesicle containing serum; this disappears after a while, and is followed by a white spot on the top of the papule. In the next stage can be seen a well-defined ulcer, varying in size; the edges are rounded and slope toward the base of the ulcer, so that the circumference of the base is half that of the outlet. The mucous membrane is covered by serum, mucus, and pus, large quantities of serum causing the patient to have a frequent desire to move the bowels. The ulcerations of amebic dysentery are very typical and should not be mistaken for any other disease. The mucous membrane of the intestine sometimes has the appearance of the skin in the

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early stages of smallpox—that is, the mucous membrane is covered by a number of papular projections. Sometimes these projections are arranged in rows occupying the long axis of the bowel; we have seen as many as four rows, one back of the other, occupying about half the circumference of the bowel, looking like mountain ranges at a distance. When the disease begins to subside the mucous membrane takes on a waxy appearance. The glands of the mucous membrane are widely separated, and in some places are almost totally destroyed from pressure of the fibrous tissue and infiltration.

Symptoms.—As a general rule, the disease is ushered in suddenly with cramp-like pains resembling old-fashioned colic, the patient usually attributing the condition to some food he has eaten, or else to overindulgence in alcohol. I might mention here that in a great many of the cases I have seen the first symptoms immediately follow the use of alcoholic liquors, so it may be that the use of alcohol has something to do with the disease, indirectly by causing indigestion and fermentation and thus providing a suitable medium for the growth and cultivation of the ameba. At first the patient has four or five movements daily, and as the disease progresses the movements become more numerous; this is due to the ulceration and to the enormous amount of serum that accumulates in the bowel, causing the patient to have a constant desire to evacuate it. This diarrhea is always accompanied by tenesmus, a feeling as if there were always something more to come away, with the passage of a little blood, mucus and pus. Of course we must remember that the so-called movements are not in reality movements, but simply the mucus, serum, and pus which accumulate as a result of the ulceration.

In some cases the mode of onset is insidious. The patient has chilly sensations with slight temperatures; subsequently the pain becomes severe and is referred to the back at the apex of the scapula. Nausea and vomiting may or may not be an initial symptom. As the right lobe is the most frequently affected, the pain may be confined to the right side in the midaxillary line, or to the epigastrium if the abscess is situated posteriorly in the region of the stomach or duodenum.

Chills and fever with sweating, severe headache, nausea and

vomiting are the most pronounced symptoms in some cases; so much so that a diagnosis of malaria is very often made and only changed when the swelling of the liver is pronounced, or the abscess ruptures.

One case seen by the writer in consultation began with severe chills, high fever and delirium, the patient passing rapidly into a comatose condition, and dying on the fifth day after the onset of the trouble.

As a general rule, the picture is clear. The patient gives a history of diarrhea lasting for some time; suddenly the diarrhea improves but he has loss of appetite, continuous lasting fever, 101° to 104° F., remittent pain over liver which is transmitted to the right shoulder-blade. The blood shows a leukocytosis, often 20,000 to 40,000, with an increase in the polynuclears. Sweating is a pronounced symptom in all cases.

Diagnosis.—The diagnosis can always be made by a scraping from the bowel, through the proctoscope, and receiving it on a warm slide; or else by examining the mucus in the stools, which have been received in a warm bed-pan. Those who are accustomed to seeing a large number of these cases readily arrive at a diagnosis by examination with the proctoscope. The ulcers are absolutely typical. The diagnosis should be verified in every case, however, by a microscopical examination. The odor is rather typical. In some cases it is necessary to give the patient a saline cathartic, afterward receiving the stools in a warm bed-pan. This method, when the ulcerations are confined to the cecum and ascending colon, will often bring the amebæ down so that they can readily be found with the microscope.

Complications.—*Abscess of the liver* is a possible but not a frequent complication of amebic dysentery in this country. In over 200 cases of this disease seen by the writer only 3 suffered from liver abscess. A fourth case, we are inclined to believe, had its origin in amebic infection; but this could not be proved, as the patient (seen in consultation at the Polyclinic) died and autopsy was refused.

In India, Africa, and other tropical countries, liver abscesses as a complication of the disease occur more frequently. Why the same conditions do not prevail here we are not prepared to

say, but are inclined to think that in tropical countries the *entamœba dysenteriœ* is perhaps more virulent and causes more extensive ulceration than in the temperate zone. It may be, however, that those who develop the disease in this country are in better physical condition, and, consequently, it does not reach the very severe stage that it does in countries where the contamination of food is more difficult to prevent, and where the climate is more enervating than here. If, as pointed out by Rogers, the amebæ are carried to the liver as emboli through the portal circulation there is no reason why we should not see abscesses just as often here as in India, as we have very severe ulceration of the intestines in this country. The cases we saw with liver abscess were very much run down. In two the abscess was single; in one there were liver foci.

Rogers believes that there are three routes by which the ameba may reach the liver: (1) through the portal circulation by blocking the capillaries in the liver; (2) by passing through the bowel wall when the intestine is contiguous to the liver; (3) by being carried in little emboli, which emboli finally lodge in the liver and set up an abscess.

Abscess of the Lung.—Sometimes the abscess is so close to the diaphragm that adhesions occur between the diaphragm and the liver. This condition of affairs is signalled by painful respiration; as a result, the patient tries to fix the diaphragm and the respiration becomes shallow; the abscess may rupture into the pleural cavity or into the lung, emptying through a bronchus. These cases are generally fatal.

Intestinal Hemorrhage.—This occurs in a very small percentage of cases. The writer had one case where the bleeding was exceedingly sharp, and the patient eventually died from loss of blood. This was complicated by a perforating abscess of the hepatic flexure.

Perforation of the Intestine occured in 19 out of 100 autopsies made by Strong. Futcher encountered three cases; Craig, four. It usually occurs in cases where there is a sufficient superimposed bacterial infection.

Enlargement of the Retrocolic Glands occurs in a large percentage of cases. Perforation of the bowels has been seen occasionally, with or without peritonitis.

Atrophy of the Mucous Membrane.—This complication has occurred in nearly every case which the writer has seen. After the inflammation has existed for a time, a change will be noticed in the appearance of the mucous membrane by observers who are in the habit of passing the proctoscope and treating these cases. At first light yellowish patches will be seen; these gradually spread and coalesce, and finally the mucous membrane has a leathery, dirty yellow appearance.

Stricture.—Stricture occurs only in very severe cases. It is difficult to explain why it is not a more frequent complication of dysentery, when one considers the extent of the inflammation and ulceration; and it has always been a difficult problem to understand why stricture follows some apparently mild cases, yet in others, where there is a severe inflammation, it does not occur. The treatment of this condition depends upon the location of the stricture and the extent of bowel involvement. If it is within reach, it can be treated by gradual dilatation; if the bowel is involved for several feet, a colostomy or perhaps some form of intestinal anastomosis may be necessary in order to relieve the patient.

Appendicitis occasionally occurs in connection with dysentery; but we are unable to say in what percentage of cases.

Hemorrhoids and fistulæ also sometimes complicate dysentery; but relief can be had by the use of local measures.

Tuberculosis, as a complication of amebic dysentery, occurs but seldom; the writer has found it in about 3 per cent. of his cases. Four times it was found primary in the appendix and caput coli, accidentally, when doing an appendicostomy. In two cases it was primary in the rectum, and this patient is still under observation. It is difficult to make a diagnosis in these cases, as there are very few symptoms other than those caused by amebic infection that would lead one to suspect tuberculosis. The presence of abundant pus in a case that had previously been passing mucus and serum should put one on his guard and lead to a thorough examination of the stools for tubercle bacilli. Loss of weight is more pronounced when tuberculosis is grafted on amebic dysentery, but as some patients suffering from amebic dysentery lose flesh very rapidly, it is difficult to know where to

draw the line. If it occurs in the rectum it may be discovered when making a proctoscopic examination, as the ulcers of tuberculosis differ markedly from the ulcers of amebic dysentery. (For the former, see p. 135.)

Prognosis.—The prognosis depends on the condition of the patient at the time of observation. The physician should make sure that there are no complications before arriving at a conclusion as to the outcome. A purely uncomplicated amebic infection, if seen within a reasonable time after the disease has been contracted, and with the patient in moderately good physical condition, should lead one to a favorable prognosis. It sometimes happens, however, that some other organism has preceded the ameba. This is particularly true in long-standing cases, and these are the ones where emetine will surely fail and formaldehyde will give the best results. We do not believe that emetine will ever entirely supersede appendicostomy. There will be a field for both: emetine in the early amebic cases and in all those where the amebæ have not entirely disappeared, and appendicostomy in those cases which do not yield to the emetine treatment.

In every case of amebic dystentery the prognosis should be guarded until tuberculosis is entirely ruled out. The writer was much chagrined at one time, after having given a favorable prognosis, to find on opening the patient that a primary tuberculosis of the appendix and cecum complicated the case. Five other cases, where tuberculosis has become implanted on an old case of amebic dysentery, have come under our observation.

Treatment.—The treatment is divided into prophylactic, hygienic, medicinal, dietetic, local, and surgical.

Prophylactic.—There is great danger of this disease spreading on account of imperfect sanitary supervision; especially is this so in the case of soldiers who have been invalided home and afterward allowed to roam at large. Several instances of this kind have come under our observation; one had suffered from the disease for eleven years, having anywhere from fifteen to sixteen movements daily. This man wandered all over the country and must unquestionably have contaminated the water in various places, thus transmitting the disease to others.

Unless some steps are taken to control and segregate these cases, amebic dysentery will become a serious menace before long, and we shall suffer from severe epidemics when conditions are favorable. The writer believes that the seriousness of this disease is not fully appreciated. He has now under his care a man who works in a butcher shop in New York, who has never been out of the country or State since he came from Austria, nine years ago. This man contracted the disease about four months ago and had been treated at various clinics with the usual diarrhea mixtures. He was having from ten to twenty movements daily. It was not until he was referred to the department of Proctology at St. Bartholomew's Clinic that the dangers of the disease were explained to him. Great pains are taken at the various hospitals to elucidate the dangers following syphilitic and gonorrheal infection; but, seemingly, no effort is made to instruct patients suffering from amebic dysentery how to look after themselves and protect others from infection.

Hygienic.—The patient should be placed in the best possible surroundings compatible with his finances. He should be instructed to be careful about his eating and drinking utensils. His underclothes should be soaked in carbolic solution before being sent to the laundry; he should be instructed to boil his drinking water; to avoid uncooked vegetables; also, in particular, to husband his strength and carry out the treatment faithfully.

Medicinal.—We have not much faith in drugs, when used alone, in the treatment of dysentery; however, an occasional dose of salts is absolutely necessary. Opium in small doses to relieve pain, and occasional suppositories of belladonna are recommended. Hyoscyamus in the form of a suppository will sometimes relieve the tenesmus and give the patient considerable comfort. Ipecac, which has been highly praised by many medical men, may be a useful adjuvant when combined with other forms of treatment; but, personally, we have very little confidence in its curative properties. A starch enema will sometimes relieve the tenesmus.

Emetine.—Leonard Rogers,[1] in a very interesting article on the prevalence and diagnosis of amebic dysentery in India, records some remarkable cures following the use of emetine salts.

[1] Lancet, October 19, 1912, p. 1062.

Dosage and Methods of Administration.—Rogers prefers the hydrochloride of emetine, which is put up in tablets of $\frac{1}{2}$ and $\frac{2}{3}$ grains. This is equal to about 60 grains of ipecacuanha. If it is administered hypodermically, about $\frac{1}{2}$ grain is the average dose for adults; if by the mouth, $\frac{2}{3}$ grain. It is given twice a day for the first two or three days, and then once a day for the next three days, which is usually sufficient for a cure. Rogers claims to have given $\frac{1}{3}$ grain subcutaneously to children under seven years of age; and in severe cases of adults he has frequently given 1 grain at one dose and repeated it in twelve hours without any toxic symptoms. In liver abscess, if given early, it will invariably prevent further complications, and in the majority of cases results in a cure without operation. In ordinary, uncomplicated cases, Rogers claims to have absolutely cured 20 out of 30 cases in which this form of treatment was administered. Two cases died, making a mortality of about 6 per cent. On an average, it takes about one week of the emetine treatment to cure a patient, and the stools are normal at the end of the third day in all cases. If this form of treatment is as successful in the hands of other men as it is with Rogers it will prove to be one of the most efficient therapeutic agents yet discovered.

The writer's experience with emetine was reported in the *Medical Record* of January 31, 1914, by his assistant, Dr. Wagner. From this report we extract the following:

"In the cases reported below the treatment was ambulatory, the patient returning to the hospital each day for examination and treatment. In the first case the buttocks were used as the site of injection; but in the others we used the fleshy part of the arms. We used $\frac{1}{2}$-grain tablets of emetine hydrochloride dissolved in 10 to 15 minims of saline solution. In these cases we endeavored to give the patient total doses of $3\frac{1}{2}$ grains in daily fractions, thus consuming seven days in the treatment of a case. Proctoscopic examinations were made as frequently as was possible, and microscopical examinations of the stools were also made at each opportunity. These examinations were made on a warm stage, and the material used was obtained from the surface of the ulcers in the bowel. When ulcers were no longer present

mueus from the bowel was utilized. At times it was necessary
to give the patients salts in order to obtain good material for
examination.

CASE I.—No. 240. P. M., aged forty-two years. Male. Mar-
ried. *Occupation:* Bottle washer. *Family history:* Negative.
Past history: Never ill before. Non-alcoholic. No tobacco. Vene-
real denied. *Present condition:* Dates back ten years when patient
had his first diarrhea. The stools at this time were watery and
had a foul odor. One week later he noticed blood and mucus in
stools. At first the blood was dark but later assumed a lighter
hue. The stools now became very numerous, numbering twelve
to fourteen a day; and associated with each movement there
were severe griping pains in the abdomen and a bearing down
sensation in the rectum. He went to a hospital in this city where
he remained for two weeks and was discharged as cured at the
end of this time. He said the diagnosis of dysentery was made.
For two years he was free from all trouble, then a similar attack
occurred more severe than the first. The patient went to a
hospital in this city where he was confined for two months, at
the end of which time he was again discharged as cured. Two
years later he had another attack which necessitated his con-
finement in a hospital for three months. Since then he has
been free until three months ago, when he was again attacked
with diarrhea. The bowel movements numbered fifteen to twenty
a day, consisting mostly of blood and mucus. Though he had
no abdominal pains between movements he suffered severe
tenesmus with and immediately following each movement. A
severe headache was almost constant. In the past three months
he had lost thirty pounds in weight.

Physical Examination.—Revealed a poorly nourished individual,
evidencing loss in weight; dirty, yellow complexion with appear-
ance of a profound anemia.

Proctoscopic Examination.—Showed typical amebic ulcers in
rectum. There was a large amount of blood and mucus in the
canal from which emanated a characteristic foul odor. A
specimen of this mucus was examined microscopically by Dr.
Jeffries (Pathologist of Polyclinic Hospital) and the *Amœba
histolytica* was found. *Treatment:* On May 14 two hypodermics

of emetine hydrochloride were administered, one into each
buttock.   The dose was $\frac{1}{2}$ grain.   The following day this
dose was repeated.   May 15: On this day the patient said he
felt better inasmuch as his bowels had moved but twice in the
previous twenty-four hours instead of fifteen times, and in ad-
dition both movements were free from blood.   The odor of the
movements was still foul.   On May 16, the following day, the
patient reported but two bowel movements for the twenty-four
hours, of a pea-soup consistency with but little odor.   He had
been absolutely free from all pain of any kind.   A proctoscopic
examination was made this day and showed a marked improve-
ment over the previous existing conditions in the rectum.   There
was very little bloody mucus in the bowel.   Another $\frac{1}{2}$-grain dose
of emetine was administered this day.   Patient returned three
days later, May 19, and was again proctoscoped.   At this examina-
tion very few ulcerations were left in the rectum and the mucous
membrane had a normal appearance.   His stools were now formed,
and for three days past his bowels had moved but once a day.
On May 20 another $\frac{1}{2}$ grain of emetine was given by hypo.
Patient reported one movement in twenty-four hours, well formed
and free from blood.   No pain had accompanied the movements
the previous week and the patient had gained one pound in weight.
On May 24 a proctoscopic examination revealed but two ulcers
in the lumen of the bowel and the patient reported regular daily
formed movements.   On June 3 patient came for treatment,
reporting three loose movements after a glass of beer on June 1.
On June 6 patient was again examined with the proctoscope and
showed a perfectly normal mucosa with no signs of any ulceration,
no mucus in stools or any amebæ in any of the excreta.   Stools
were now hard and well formed.   On July 11 patient returned
for observation and reported that he had some diarrhea after
drinking beer or eating sour food.   Was given 5 grains of
ammonium bromide and 10 grains of sodium bromide *t. i. d.*   On
the following day patient reported cessation of diarrhea and since
then there has been no recurrence.   One month later patient was
still free of all trouble regardless of what he ate or drank.

  This was the first case in which we had an opportunity to test
the efficacy of emetine as a specific in an amebic case.   For

this purpose the case was an ideal one. Typical ulcers were present in the bowel, the amebæ were found, and the patient was having from fifteen to twenty movements a day. The above history describes most graphically the effect of the administration of the emetine.

CASE II.—No. 279. W. P., aged thirty-three years. Single. Shoemaker. *Family history:* Negative. *Past history:* Diphtheria at thirteen; malaria and dysentery in Philippines in 1899 (fourteen years ago); chancroids in 1901 (sixteen sores). Moderate drinker and smoker. General diet. *Present condition:* Dates back to 1899 when patient contracted dysentery in the Philippine Islands. At that time had twenty to thirty daily movements with severe tenesmus. Was in the hospital for two months, and although at the time of his discharge he was improved, he still had three or four soft movements each day, occasionally passing blood. This condition had persisted for all these years and for the past six months he had had at least six movements a day with passage of blood and mucus. Occasionally he has severe tenesmus and complained of great weakness. He was at least thirty pounds under his normal weight.

Physical Examination.—The patient was extremely thin and sallow. The spleen was enlarged, though there had been no malarial attacks in seven years.

Proctoscopic Examination.—The entire mucous membrane of the lower bowel was thickened and edematous, and there were numerous small and coalesced ulcers surrounded by an area of swollen white tissue. Temperature, 99.6; pulse, 90; respiration, 18. A microscopical examination of the mucus obtained from the surface of the ulcers revealed the presence of the *Amœba histolytica.* Treatment was instituted on June 27, $\frac{1}{2}$ grain of emetine being injected into the subcutaneous tissue of the right arm. This was repeated on the following day, the left arm being used. There had been no improvement. This dose was repeated on June 29 and 30, and on the last occasion patient reported but one movement for the preceeding twenty-four hours, stating further that for the first time in years his stool seemed to be entirely free from blood. The movement was of semi-solid form. On July 1 the report was four

watery stools with traces of blood. Again ½ grain emetine was given by hypo. On the following day he reported three stools, soft, but no pain accompanying the movement or blood in the stools; ½ grain emetine was injected. July 3, the following day, was exceedingly hot and the patient felt very much depressed, consequently no emetine was given this day; there had been two soft passages in the past twenty-four hours. July 4, two movements, no pain. July 5, one movement, slight abdominal pain, no blood in feces. July 6 and 7, one stool, well formed, no blood or mucus; ½ grain emetine injected. On July 7, 8, and 9, there was one normal movement each day, without concurrent symptoms. On July 9, ½ grain of emetine was injected. On July 11, the patient returned for examination. His appearance was greatly improved, the pallor was not nearly so marked, his appetite was better, and he was having one normal movement each day. A blood count was taken and showed 4,200,000 red-blood cells and 15,000 white, as compared with 3,800,000 red cells and 18,000 white on June 23. A proctoscopic examination showed the mucosa to be somewhat pale and anemic but absolutely free from any kind of ulceration or other abnormality. No mucus was present except in normal state, and no amebæ were to be found in the excreta. July 16 was the last visit of the patient and on this occasion the mucosa of the lower bowel showed a decided improvement over the condition existing five days previously. The anemia of the mucous membrane was no longer present, although, as before, no ulceration was evident. The patient said he felt like a different man, was having but one movement a day, rarely two; stools were perfectly normal in character and to all intents and purposes a cure had been effected.

CASE III.—No. 281. J. S., aged twenty-six years. German sailor. Present condition dates back to a sojourn in India, one year ago, since which time patient has had a steady diarrhea. This consists of a bloody, mucous, watery stool, more frequent at night, during which patient claims he has movements as frequently as one every hour. Proctoscopic examination showed that *amœba histolytica* was present, together with the typical ulcer of amebic dysentery. The general condition of the patient was

good and on July 27 the injection of $\frac{1}{2}$-grain doses of emetine was started and continued for seven days. The arms of the patient were utilized as the site for injection. After two injections the bowel movements dropped to one a day and so continued to the end of treatment, at which time the proctoscope showed that the lower bowel was clear of ulceration. Further trace of the patient was lost, as he failed to return after the seventh day. It is presumed that he had no further difficulty.

From our experience with emetine hydrochloride injected in cases of amebic dysentery we draw the following conclusions:

1. Emetine hydrochloride is a specific in dysentery due to the *Amœba histolytica*.

2. The method of administration is hypodermically in daily doses of $\frac{1}{2}$ grain of emetine hydrochloride dissolved in sterile water, extending over a period of seven days.

3. The effect upon the pathological condition is most pronounced and immediate. At the end of seven days all the symptoms of the disease have disappeared.

4. The patient shows no ill effects from the use of the drug.

5. To date there has been no reason to suspect the possibility of recurrence.

6. Two or more doses may be injected in cases of diarrhea to assist in diagnosing the origin of the dysentery. Improvement indicates an amebic dysentery.

Dietetic.—On general principles a diet that is easily digested and offers the greatest amount of nutriment with the least dissipation of energy is the ideal diet. So far as our personal experience goes we have had less trouble with the dietic treatment than with anything else. Patients very seldom yearn to eat things that disagree with them, and as supporting measures are necessary to the welfare of these patients, it would seem bad policy to limit the diet. We are aware that some patients are restricted to a milk or nitrogenous diet; but it has always seemed to be a better policy to be more liberal, and experience has confirmed us in this view. In all these intestinal conditions we have found the *test diet of Schmidt* (see page 427) to be the most useful nucleus on which to build. By starting the patient on this diet and gradually adding to it excellent results can be obtained.

Local.—After all, local treatment by irrigations with the patient in the knee-chest posture has given us the best results next to appendicostomy. Before discussing the various forms of local treatment a description of the proper method of giving an irrigation may be profitable (see page 241). Erroneous ideas as to the correct way of giving an injection seem to prevail not only among the laity but to a great extent among medical men.

The next question that arises is what kind of solution should be used in the irrigation of these cases, or what solution gives the best results without inconvenience to the patient. By our method salt solution and formalin have given the best esults. These irrigations are given night and morning and are kept up until all evidence of the disease has disappeared. In the early days we tried a number of medicated solutions such as quinine, copper sulphate, nitrate of silver, hydrogen peroxide, ichthyol, tannic acid, and so on; but we cannot say that the results were any better than those obtained by the use of salt solution, and salt solutions failing, formaldehyde.

This treatment should be kept up systematically for at least a month after all evidence of the ameba has disappeared. Sometimes on account of a mixed infection which seems inevitable in this region, no matter what the original cause of the ulceration, great difficulty is experienced in stopping the diarrhea. In this case the treatment must be kept up until all the ulcers have healed, perhaps substituting ichthyol, or using it ultimately with salt solution.

The question has been frequently asked, "When is an appendicostomy indicated in amebic dysentery?" The rule we follow is to put all patients on local treatment for a couple of months, and if at the end of that time there is no material improvement we suggest an appendicostomy. We also recommend appendicostomy where the patient is so situated that, either from lack of intelligence or from other inability, he cannot properly carry out the irrigation treatment. A great many patients object to the discomfort of the knee-chest posture irrigations in this position. Under such circumstances it is wiser to do an appendicostomy at once. Of course the normal habitat of the *amebæ dysenteriæ* is the cecum, and the rectum is secondarily infected by the gravitation of the amebæ.

The *surgical treatment* in appendicostomy consists in making an opening in the appendix after it has been anchored to the abdominal wall. (For a full description of this operation, after-treatment and complications, see page 447.)

Appendicostomy has given the most reliable results, so far as the author is concerned, as not a single death occurred in over 100 cases that have been operated on, and so far as we have been able to follow the patients, all were cured. In this statement we are not including the five cases that were complicated by tuberculosis.

Even after an appendicostomy has been performed, where the bowels are temporarily short-circuited, irrigations should be continued, as we have found that when the bowel is allowed to rest there is a temporary increase of the infection with an accumulation of large quantities of pus, due, we believe, to the fact that the bacteria are not disturbed, there being no current to keep the bowel clean.

Bilharzial Dysentery.—Dr. Belleli was the first to draw attention to a form of rectitis associated with polypi due to deposits of Bilharzial hematobia. In his case he removed the polypi and from them recovered the Bilharzia. Of course polypi are always the result of some infection of the bowel, but this form of infection is comparatively rare in this country. It appears that next to the rectum the bladder is most frequently attacked.

Symptoms.—The earliest symptoms are severe inflammation of the rectum, with redness and thickening of the mucosa, which has a granular appearance. It is covered with mucus, pus, and occasionally blood. The stools are frequent, sometimes fecal; at other times they contain only mucus, pus, and blood. Later on polypi spring up all over the bowel and are friable, deeply furrowed and bleed easily. The bowel becomes very much thickened, so that in some cases it can be felt through the abdominal wall. As the disease advances, abscesses formed by branched or multiple fistulæ open near the anal margin, external or internal to the sphincter, or on the buttocks or the inner aspect of the thighs. As a result of this the tissues around the inflammatory foci are sclerosed, hardened and calloused, and the skin assumes a warty appearance.

Diagnosis.—The differential diagnosis between Bilharzial rectitis and rectitis due to other infections can only be made by the finding of the worms, as the general appearance and the course of the disease is similar to that of a chronic interstitial and acute rectitis, or a chronic interstitial and acute exudative colitis with hypertrophy and hypersecretion of the glands. In those latter cases the mucous membrane is a dusky red color and has a bosselated appearance.

Treatment.—Internal medication, so far as we know, is of no avail in Bilharzial infection. Gobel and Maddon suggest a thorough scraping of the lower rectal and sigmoidal mucosa or even rectal resection or excision. Wildt believes that all the polypi within reach should be removed. Le Grand is in favor of an operation somewhat similar to the Whitehead, or on the principle of Delorme's operation for the treatment of prolapse of the rectum. The great objection to all those operations, and indeed Le Grand has indicated those objections, is that it is not always possible to dissect off the mucous membrane as high as would be necessary in order to remove all the diseased tissue. Besides, these operations are very difficult on account of the inaccessibility of the upper portion of the rectum, the severe hemorrhage and the painfulness of the subsequent drainings. Taking it for granted that the operation can be done (and it is possible in some cases), it is doubtful if this procedure will cure the patient, as the worms are harbored in the portal circulation. It seems to the writer that the methods mentioned are at best a makeshift and poor surgery. Imagine the infection that would be likely to result from such procedure (we refer particularly to dissection of the mucous membrane), and, taking it for granted that the patient survives, a stricture would almost certainly result, and it is doubtful if the patient would countenance such an operation if the facts were put before him, including the tedious subsequent convalescence. If any measure of an operative character is to be considered, it would seem that the radical operation would be the procedure of choice, and even then it would be of doubtful utility, considering the source of the infection. Then again the infection may have involved other parts of the colon, and one has no assurance that the infection is not patchy in

character. There seems no good reason why other parts of the colon may not be involved. In most of the cases which the author has seen, where polypoid growths were associated with inflammation of the rectum, the colon was also involved, and we have seen at least 15 cases. The writer believes that the only safe and sure method is the removal of all diseased tissue; if necessary, removing the entire colon, the operation to be preceded by an ileostomy. After the patient has learned to care for himself, and this usually takes a month or two, an ileostomy, in the experience of the writer, is no more uncomfortable as far as the patient is concerned than an artificial anus in the sigmoid. In all cases where the colon is involved in a severe inflammation where there is ulceration with the formation of adenomata, an ileostomy should always precede a radical operation in order to put the colon at rest and the patient in the best possible position to withstand future interference.

Mucous Colitis.—Mucous colitis is not an entity but merely the expression of some functional or organic disturbance of metabolic or infectious origin manifested by increased secretion of mucus, irregular action of the bowels, colicky pains, and disturbances of nutrition, resulting in an aggregation of nervous manifestations termed neurasthenia.

No doubt exception will be taken to our definition of this much written about but little known condition. Until very recently medical men believed that colitis was of neurotic origin, but the surgeons were not satisfied that this was the point of attack. It was more plausible to impute a toxic origin to the nervous manifestations which accompany this symptom than *vice versa*. As everything must have a beginning, one can more readily explain the nervous manifestations as an effect than as a cause. Of course we can understand that there are certain individuals who come into this world with imperfect insulation of their nervous systems; but having seen a great many of these cases, especially cases of enteroptosis, and but very few cases of mucous colitis in these individuals, we are inclined to believe that the nervous manifestations result from disturbed metabolism, whether this be of infectious origin or due to some defect in the internal secretory organs. We allow that this seems very indefinite, but reasoning from analogy it is plausible. We know the nervous manifestations that follow disturbances in thyroid secretion and know that diarrhea is also a manifestation of this disease. We also know that there is such an intimate relationship between all the internal secretions that the disturbance of one is apt to throw all the others out of gear and so demoralize metabolism and result in neurasthenia. But it may be asked how we explain those cases of mucous colitis of mechanical origin? These are best explained in the same way. Any obstruction or

interference with the natural function of an organ is bound to react on the secretory and allied functions of that organ. Take the appendix, for example. We know from the experiments of Sir William Macewen of the influence of that organ on the secretion and function of the large intestine. He showed conclusively that when the appendix was irritated the secretion was first increased and then dried up if the irritation was kept up. Does not this correspond exactly with our clinical experience? Is not an acute appendicitis ushered in by diarrhea, and are we not in the habit of associating constipation with chronic appendicitis? To be sure, we know very little about the internal secretions and the nervous mechanisms and other interdependent and interlocking systems of organs or nerves that control digestion; and it seems to us that as nothing has ever come of the theories advanced by the neurologists and accepted for a number of years by the medical profession, it would be well to seek fresh fields and pastures new and to investigate the secretory influence on this so-called disease.

The only cases of this condition that we have seen cured were those due to functional interference with the organ, or some digestive disturbance that could be cured by restoration of the function of the organ, or dietic measures. We are free to confess that we have never seen any improvement following the liberal use of pharmacopœial preparations usually suggested for neurological conditions. We have seen cases cured by drugs or extracts of glands connected with or influencing digestion. Therefore, it seems more reasonable to suppose that these nervous manifestations are an effect rather than a cause. After a very large experience with this class of patients we find that our knowledge of the subject is still vague. To be sure we have cured many cases, especially where there was something tangible, such as an adhesion or an angulation, or where the function of the organ could be restored and interference with this function removed. We have also cured cases by the extraction of some organ or by corrective digestive medicine, but this is not at all satisfactory, and until something more definite is known we shall have to follow our clinical knowledge or be satisfied with empiricism rather than reason.

Varieties.—We may classify the disease into membranous colitis and mucous colitis. In our opinion it is a poor classification, but it is the best that can be offered at the present time for clinical study. The difference between a mucous colitis and a membranous colitis is one of degree. If the trouble is located in the upper regions of the large intestine we usually have what is known as the membranous type. If the lesion is situated high up, with an increased peristalsis, we may have a mucous colitis. If the lesion is situated in the sigmoid we usually have a mucous colitis, and it is possible to have a membranous colitis if this condition is associated with constipation. We have shown also that faulty innervation can influence peristalsis, secretion, and absorption, and we are convinced that the majority of cases have as their origin some definite local or reflex pathological lesion.

It is therefore important to make a thorough examination of the excretions and secretions in each and every case, in the hope that we may possibly locate the cause and throw some further light on this subject.

The writer has made a nitrogen and sulphate partition with an examination of the feces in a number of those cases where no gross pathological lesion was evident, and outside of a change in the bacterial flora there was no evidence of any other digestive disturbance.

A scientific classification based on the pathological findings in this condition is impossible at the present time, owing to the meagerness of data now available on the pathology of this disease. It would seem, therefore, better to consider the disease according to the known pathological causes and classify those cases of indefinite origin under the head of secretory colitis.

We have never seen a case of mucous colitis where there was not some pathological change in the mucous membrane. The neurotic theory is very strongly supported by clinicians such as Nothnagel, Weigert, Harrison, King, and others, who claim that no pathological erosion exists to account for the colitis, and yet by the very name colitis they imply an inflammatory condition of the colon. The secretion of mucus cannot possibly cause the disturbances that result from this disease. The passage of mucus is merely a manifestation of the disease and its presence

in the bowel cannot be of material harm to the patient. In fact, as far as our knowledge goes, we are inclined to think that it is beneficial and that it is possibly nature's method of protecting the body against bacterial or toxic invasion. Our own idea is that in every case of colitis the toxemia is a result of colonic disturbance and that the symptoms attributed to the colitis are due to the action of the toxemia on the nervous centres; that the toxemia, by its action on the nervous system and on the internal secretions, causes those metabolic disturbances which are associated with colitis, and that the accumulated effect of these poisons causes the crises which occur periodically. The diarrhea is the effort on the part of nature to rid the organisms of the accumulated toxic and fecal matter. The digestive disturbances alone that would result from a simple inflammation of the colon are not sufficient to cause in the organism the profound changes that accompany colitis. We believe that the symptoms of this disease are regulated entirely by the amount of toxin absorbed. We see cases of colitis due to some lesion in the sigmoid where there is very little if any disturbance, and if it were not for the fact that the patient's attention is drawn to this abnormal discharge of mucus he would not appreciate that there was anything wrong.

When the trouble is situated high in the colon or in the ileum the manifestations are always more profound. The fact that Nothnagel, in some few autopsies, found no apparent lesions to account for the symptoms does not prove that the patient during life did not suffer from an auto-intoxication. Again, we have no evidence that there was not some change in the mucous membrane, because the simple discharge of mucus, as we said before, could not possibly cause any trouble. Besides, the mucous cells do not secrete except when there is some disturbance of circulation followed by congestion and inflammation. We note that the normal mucous membrane of the bowel has a protective influence, and any change between the physiological and pathological state lowers the vitality of those cells and diminishes in proportion their power to protect the body against the invasion of organisms of toxemias, and when ulceration occurs this protective influence of the mucous membrane is almost *nil*. We also

know that a poison which under ordinary circumstances causes no symptoms will, when the mucous membrane is ulcerated, cause a most profound intoxication in one-ninth the original dose, and we know that enzymes of the body are highly toxic and that the organism is protected from their poisonous effects by the changes that take place in the mucous membrane of the intestine.

Chirrin and Cassin, as far back as 1887, showed that toxins, which are absolutely fatal when injected into the circulation, lose their toxicity when taken by the mouth in the same dose, and that it would take fifty times as much by the mouth to get the same toxic effect as by the circulation. The usefulness of this membrane has been proved in a thousand different ways since. We have an analogous condition in the peritoneum. Sargeant and Dudgeon show that if the endothelial cells of the peritoneum are not broken the absorption of toxins is *nil*, except where the lymphatic channels are numerous, such as in the diaphragm.

The clinical fact has long been recognized that emotional states, such as fear, anxiety, or sorrow, are followed by intestinal disturbances. This has since been verified by Cannon. Previous to this Sir William Macewen had an opportunity to prove this on the living subject.

Temporary constipation often follows depressing emotions, and many constipated people find that the difficulty they experience in getting their bowels to act increases whenever they are worried or annoyed. The following case, described by Goodhart, is a good example of this kind of constipation:

"A man of the most regular habits was in a bad railway accident, and he was buried in a complete wreck of carriages for thirty-five minutes. He was not broken, but his nervous system was so shattered that for days his bowels refused to act, although he took all sorts of things to make them do so."

Cannon proved by x-ray observations on cats that anger produces intestinal stasis by causing inhibitory impulses to pass down the sympathetic nerves. The constipation which results from depressing emotions is probably brought about in the same way. This would explain the fact that bromides often have a better effect on the bowels in such cases than purgatives.

It might be expected that the constipation of neurasthenia

and hypochondriasis is also of this nature. Though direct inhibition may increase the intestinal torpor in such cases, it is probable that depression of reflex excitability is, as already described, the chief factor. Thus, in none of the cases of neurasthenic constipation which I have examined with the x-rays was there any of the delay in the small intestine which is characteristic of constipation due to inhibitory influences. Moreover, neurasthenic constipation is readily, though only temporarily, relieved by aperients, which are generally of little value unless given with opium, when constipation is due to inhibition (Hertz).

We must admit, then, that all patients of this type are constipated, neurotic, suffer from enterospasm, auto-intoxication, and finally from colitis. Look at it as you will, a great many cases of colitis are caused by constipation, and the etiology of constipation is the etiology of colitis in these cases. Colitis is the result of constipation, and mucus is only a manifestation of inflammation.

Etiology.—The etiological factors concerned in this disease are enteroptosis, the abuse of carthartics, enterospasm, insufficiency of the liver, hot enemas, interference with the function of the intestine, reflex interference and chronic appendicitis.

Following are some of the factors that must be considered in all cases of colitis: First and foremost, chronic tuberculous trouble; mobile cecum; chronic intussusception; inflammation of the gallbladder; intussusception of the sigmoid; adhesions between the uterine appendages and the colon; diverticulitis; malformations of the uterus; movable or floating kidney.

Enteroptosis is an indirect cause of colitis. The majority of individuals who suffer from this trouble are poorly nourished, suffer from indigestion, are constipated, suffer from auto-intoxication, have very little resistance, their nervous condition is aggravated, a vicious circle is established, and colitis results.

Hertz has shown that there is no delay in the passage of chyme through the small intestine in the cases we have mentioned, and when constipation does occur in these cases it is always in the large intestine.

Enterospasm is frequently a cause of mucous colitis and no doubt is accountable in a large percentage of cases for the pain

associated with this disease. We have seen several cases where this condition has been diagnosed as a tumor of the colon, and in one case the mere handling of the abdominal wall caused the most intense spasm.

Insufficiency of the liver is occasionally an etiological factor due to the irritation of the bowel by the excess of fatty acids. We had one case in our practice which was very much relieved by putting the patient on ox-gall.

Enemas at a temperature a few degrees above body heat are very injurious and undoubtedly are factors in the production of colitis.

Under the heading of *mechanical interference* come adhesions, bridles, angulations and pressure by other organs.

Reflex interferences are too numerous to mention; but we will refer to chronic appendicitis, which, in our opinion, is one of the most important etiological factors in the production of colitis. We could relate several cases where the removal of the appendix has cured the colitis and the accompanying constipation.

Another circumstance to be taken into account is that a chronic inflamed appendix is an incubator for bacteria, and that these bacteria are constantly being thrown into the large intestine, adding materially to the damage already done.

The other prominent reflex causes are ptosis of the kidney, aneurysm as mentioned by Tuttle, inflammation of the gall-bladder, inflammation of the tubes and ovaries, and retrodisplacement of the uterus in the female.

Pathology.—In this condition there will be found an interference with the circulation causing congestion; disturbed innervation, secretion, and absorption; and increased or delayed peristalsis. There is usually an increase in the number of globules of the mucous cells, infiltration, shedding of the epithelium, followed by ulceration and infection, and thickening of the mucosa and submucosa.

Symptoms.—The symptoms must of necessity vary somewhat according to the lesion which causes the trouble. Most cases begin with an increased peristalsis, rumbling of the bowels, increase in the number of daily movements, with what may be called a diarrhea. This goes on for some time and the patient

has a period of rest, with constipation. Digestion in the meantime is rather distressing, the patient feeling uncomfortable; the tongue is coated, the patient sleeps poorly and has very little relish for food. Owing to the accumulation of gas and fecal matter, or to some indiscretion in diet, an attack of acute diarrhea is precipitated, with colicky, twisting pains, and from five to ten movements daily. At this time large casts of the bowels are passed with quantities of clear mucus, mucus stained with blood and pus, or mucus with feces. This subsides after two or three days and the patient is fairly comfortable, but again suffers from constipation. After this condition of affairs has existed for some months, food of every kind but the simplest is avoided,

Fig. 123
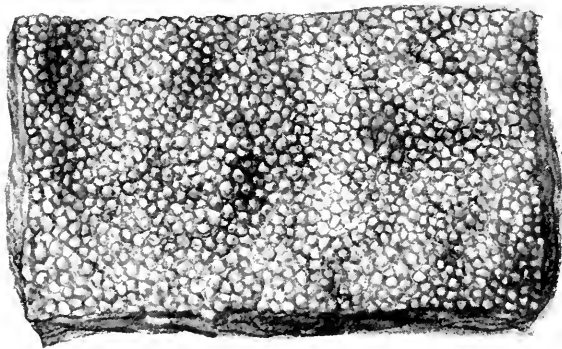
Acute inflammation of colon. (Lynch.)

the result being loss of weight, exhaustion on the slightest exertion, with insomnia and a muddy, cachectic complexion, giving the impression of some malignant condition.

Pain.—According to Professor Lenander, of Upsala, Sweden, sensations of pain within the abdominal cavity are transmitted only by the phrenic nerve, the lower six intercostals, or the lumbar and sacral nerves; and putting the cerebrospinal nerves on the stretch causes pain. It is our opinion that all painful sensations within the abdominal cavity are transmitted by the parietal peritoneum. The twisting, colicky pains which occur in colitis and which heretofore have been attributed to the presence of the membrane of mucus are, we believe, due either to the dragging

of the intestine on its mesentery in an effort to straighten itself, or to the dragging of a bowel on an adhesion between it and the parietal peritoneum. Sometimes it is initiated by the accumulation of gas; at other times it is an effort on the part of nature to empty an overloaded and distended bowel. Violent peristalsis is set up in the intestine, and as a result the patient has one or several semi-solid movements. Owing to this extra activity on the part of the intestine there is an increased blood-supply and as a result of this there is an increase of secretion. The goblet cells naturally share in this process. This increase is not noticed under normal conditions because the mucus increases *pari passu* with the other secretions and under pathological conditions there must be an enormous output of mucus during these cycles. The profound nervous symptoms of neurasthenia, as we have already mentioned, are due to the toxemias associated with this disease.

Reflex Nervous Symptoms. — Still another factor is that chronic appendicitis almost invariably ends in adhesions, so that as time goes on a condition that was mild at first may, if allowed to continue, end in ulceration and result in material damage to the colon.

Treatment.—The treatment, to a great extent, depends on the site and character of the lesion. If the trouble is in the sigmoid we are not likely to have symptoms of auto-intoxication, as here all the water has been absorbed before the fecal matter reaches this point and the feces are naturally very dry in this portion of the colon and absorption is almost *nil*. On the contrary, if the lesion is in the ascending or transverse colon we are almost certain to have severe symptoms of auto-intoxication. We believe, though, that most of the symptoms of auto-intoxication are manifested when the lesion is in the ileum, within the first two or three inches orad to the cecum. Under all circumstances a careful and searching examination should be made and all means at our disposal must be brought into requisition. The patient should be put on a test diet, and following this an *x*-ray examination will prove helpful in locating the lesion, especially if it is mechanical. Dilatation of the cecum can be demonstrated, and this is frequently associated with chronic appendicitis.

Angulations and strictures have been located by means of the *x*-rays.

The treatment resolves itself into hygienic, dietetic, local, surgical and medicinal.

Hygienic treatment consists in changing the surroundings, absolute rest both mental and physical, warm baths followed by cold sprays to the spine, electricity, and in every way possible improving the patient's mental and physical condition. We have seen the greatest change take place in some of our patients by a simple change in surroundings and locality, or taking them away from the home atmosphere, and this must always be considered whenever possible in the treatment of these cases.

Dietetic Treatment.—Contrary to the general belief, it is our opinion that a nitrogenous diet is harmful in most of these cases. A great many authorities, hitherto have believed in this form of diet because of the supposed fact that the nitrogenous foods were mainly cared for by the stomach, and that by a diet almost exclusively of this nature very little residue would be left to cause irritation in the bowel. We have learned more recently that auto-intoxication results from bacterial action on the end-products of protein digestion. We know that the diet we have mentioned is very harmful and must necessarily aggravate the symptoms. These patients seem to do very well on fats, carbohydrates, and very little protein. The diet as prescribed by Professor Schmidt has proved useful in our hands. The regimen suggested by Professor Combe, as mentioned in the chapter on Auto-intoxication (page 428), should prove useful.

Either of the diets we have mentioned can be gradually added to, depending upon the requirements of the individual. It is best, however, to have some basis on which to build, and the diets we have prescribed are simply meant to serve this purpose. There is no one diet that we know of which is suitable in all cases of colitis, and it it only by perseverance and careful observation that the proper dietary will be found to meet the requirements of the individual case. If the patient does not thrive on the diet we have suggested, it would be well to add to the fats in order to increase the caloric value of the food, and in this category must be considered those easily digested fats like cream, olive oil,

yolks of eggs, and fresh butter. Of course fats which do not melt at the body temperature must be administered carefully. Experience has shown that patients suffering from colitis do better on a fatty diet than any other. The carbohydrates must next be drawn on if the calories are to be still further augmented. Here we have the cereals, especially rice, to draw from. Lastly, the proteins may be administered cautiously, because, as has been suggested in the early part of this chapter, these patients may suffer from auto-intoxication.

Local Treatment.—A great deal of relief can be obtained by judicious local medication with the addition of lavage. As there is some misunderstanding about the proper method of colonic irrigation it may be well to devote a few paragraphs to this subject.

All the clothes being loose, the patient is placed in the knee-chest posture. A diagram of this position has been given in a previous chapter (p. 33). The bag or irrigator should be hung about 6 to 12 inches above the patient's hips, the height depending on the force required to barely overcome the intra-abdominal pressure. As all these patients suffer more or less from spasm of the bowel, it is very important that the force exercised should not be more than is required to overcome the intra-abdominal pressure.

Tube.—We are in the habit of using a No. 10 French catheter which is passed into the rectum for about 2 or 3 inches, and this is the only rectal tube we recommend in these cases. Tubes of larger caliber permit a large volume of water to enter the bowel, causing spasm and negativing the object for which the lavage was intended. To be sure, it takes a long time to get a quart or two of water into the bowel by this method, but it causes the patient very little inconvenience and a larger quantity of water can be administered if the method that has been suggested is followed.

A normal salt solution is the best for everyday use. Occasionally medicated solutions are necessary. The following solutions have proved useful in our hands:

A 25 to 75 per cent. solution of aqueous fluid extract of krameria, 2 per cent. ichthyol in water; 1 per cent. to 2 per cent. solution

of tannic acid in water; irrigation with calumbo (about a 2 to 4 per cent. solution). During the acute attacks, when the stools are very offensive, irrigation with one or two pints of 2 per cent. solution of peroxide of hydrogen gives very satisfactory results when alternated with the tannin. If enterospasm is associated with the colitis a lavage with olive oil, about a pint, heated to about 102° F., will afford the greatest relief. We must say, however, that we have had the best results with warm ichthyol irrigations. Finally, we would add that great care must be exercised in the administration of the enema. There are some individuals, especially those who suffer from enteroptosis, who rebel at the use of anything in the way of medication in this line. For this reason, when the patient tells the physician that he or she cannot take an enema without great suffering, the greatest caution should be observed if the wish of the patient is disregarded. We have seen patients suffer the most intense agony, with symptoms of shock, following the use of enemas and lavages. During the colicky pains and spasms a small dose of codeine, say half a grain, will afford the greatest relief, as will also hot packs applied to the abdomen.

Medicinal.—The medicinal treatment consists chiefly in combating the constipation. Among the drugs that have given the most satisfaction mention may be made of castor oil, 40 minims dose, administered at bedtime; Carlsbad water, a teaspoonful to a glass of warm water before breakfast, especially in cases of enterospasm; fluid extract of cascara, 5 to 20 minims, in a wine-glass of water at bedtime. During the acute attacks, if the diarrhea is very persistent, the best drug to administer is the salicylate of bismuth in 5-grain doses every three hours. Where there is hyperacidity of the stomach a teaspoonful of peroxide of hydrogen, given with meals, very often affords great relief. In case of insufficiency of the liver, ox-gall may be given; insufficiency of the pancreas or some insufficiency in the intestines may require taka-diastase in 5-grain doses; pancreatin, dose of 5 to 10 grains, put up in capsules hardened in alcohol. The object of this is to hold the pancreatin intact until it reaches the duodenum. By following this suggestion it will pass through the stomach unchanged.

Surgical.—The surgical treatment of this condition has occupied the attention of some of the greatest surgeons both in this country and in Europe. Sufficient evidence is not yet at hand to prove the value of surgical treatment in these cases. Of course, in speaking of the surgical treatment, reference is made to those forms of colitis which are not strictly surgical from the beginning, such as angulations, nephroptosis, bridles, and conditions that are only relieved by surgical measures. What we have in mind especially in speaking of the surgical treatment of chronic colitis is the opening of the colon either by appendicostomy or cecostomy for the purpose of irrigating the large intestine. Both of these operations are described (pages 444 and 447), and it need only be said that in our experience a large percentage of cases of chronic colitis are immensely benefited by surgical measures which permit of lavage of the entire large intestine, and, if necessary, the small intestine. Furthermore, it would seem that by local measures it might be possible to change the bacterial flora. Another advantage of this procedure is that it affords a chance for further study of these cases which would otherwise be impossible. Isolation of the principal bacteria that are responsible for this condition is a difficult matter because of the number of bacteria that inhabit the intestinal canal. However, it is only by perseverance that we can accomplish anything, and the study of this condition opens up a large field of study both for the clinician and the bacteriologist.

Ulcerative Colitis.—Sometimes during the existence of a chronic colitis ulceration results, especially if the colitis is associated with obstinate constipation, and it must be remembered that no matter what the original cause of the ulceration is, after it has existed for some time the process is carried on by a number of bacteria other than the original. In other words, any ulceration of the colon becomes a mixed infection after it has existed for some time; and, as there are so many varieties of bacteria in the intestinal tract, it is very often difficult to say which variety of bacteria predominates. This is one reason why so many cases of amebic ulceration continue to give trouble long after the amebæ have disappeared from the stools. Ulcerative colitis, although described separately, is really a terminal process of the

chronic colitis. The original offenders may be the *amœba dysenteriœ*, the tubercle bacillus, the streptococcus, or the colon bacillus.

Hemorrhagic Colitis.—Hemorrhagic colitis is an unusual form of severe infection of the colon which involves not alone the colon but also the appendix and terminates abruptly at the ileo-cecal valve. So far the writer has seen three cases; but has had an opportunity of studying only one for any length of time. Its onset is sudden and apparently without cause. It increases in severity, the patient runs down very rapidly, and if not checked it is apt to end fatally in a short time. The diarrhea is profuse, beginning with a few loose movements and increasing gradually, so that at the end of a week the patient has from ten to twenty movements daily. The cases seen by the writer were in adults between the ages of twenty and thirty.

The Stools.—At first blood appeared either mixed with the feces or pure; afterward mucus and blood; and later blood, mucus, and pus. The odor is very foul and the quantity of pus varies. Sometimes it is ,passed in large quantities, as if an abscess had ruptured; and then again there is very little. Although the stools are frequent, the amount varies between 1 and 10 ounces. Not only is there a variation in the quantity but also in the frequency. There was no pain, rise of temperature, or tenesmus connected with any of the cases seen by the writer; and this is rather re-markable when we consider the amount of surface involved and the quantity of pus passed. The amount of blood lost in twenty-four hours is considerable, so that a severe secondary anemia would be expected. Nothwithstanding this, the percentage of hemoglobin is high. In our cases it was never below 60 per cent., and there was no abnormal cell formation; on the contrary, in Mummery's cases the pulse was rapid and almost impercept-ible, the temperature was raised, and the condition of his patient resembled that of an individual with typhoid. There was also severe abdominal pain in Mummery's cases; but in our own, except at first, when the patient had some stomach-ache, there was nothing to indicate that the disease was ever painful.

This disease is unlike anything else we have seen; it involves the entire bowel and the peritoneum and then attacks the fat outside the bowel. It is probably more frequent than is supposed

and is mistaken for amebic dysentery, tuberculosis, or cancer, on account of the rapid loss of weight and the diarrhea.

The following case came under our observation soon after the patient contracted this trouble. She was perfectly well up to March 12, 1911. About this time she had a sharp attack of diarrhea which lasted ten days. Two weeks after she complained of epigastric pain, coming on from one to two hours after meals, and associated with heart-burn. Examination of the stomach contents showed simple hyperacidity. Antacid treatment relieved all symptoms. Bowels, with the exception above noted, regular; urine normal. Physical examination, September, 1911, revealed no abnormalities other than an occasional friction sound and occasional inspiratory crepitant râles over the right apex posteriorly.

The onset of the present condition occurred in July, 1912, when a slight amount of blood was noted at stool. Anusol suppositories were ordered by the physician in attendance at the time with good results. About two months later bleeding began again. Examination revealed two fissures radiating forward from the rectum. Rectal examination was negative. Under protargol the fissure healed rapidly but the bleeding continued. Proctoscopic examination December, 1912, showed an intensely congested membrane studded with pin-point ulcers. Mixed treatment internally, combined with silver nitrate irrigation locally, produced diarrhea and augmented the amount of blood passed. In February, 1913, another proctoscopic examination was made by a different man, who noted the same pathological picture, but ordered bismuth, iodoform, olive oil irrigation to be retained all night and a krameria; glycothymoline irrigation for morning use. Following this treatment there was a slight improvement which lasted for two weeks, when the bleeding began again in increased amounts.

Noteworthy in the course of this disease have been the lack of pain, absence of fever, minimum amount of tenesmus, only occasional diarrhea, and the excellent general condition of the patient.

Urine analysis at frequent intervals showed a normal finding. March 1, 1913: hemoglobin, 65 per cent.; March 8, 1913,

hemoglobin, 70 per cent.; red-blood corpuscles, 4,600,000; white-blood corpuscles, 9600; polymorphonuclears, 76 per cent.; lymphocytes, 22 per cent.; eosinophiles, 2 per cent.

Moderate poikilocytosis and anisocytosis were present. March 22, 1913: white-blood corpuscles, 10,000; polymorphonuclears 74 per cent.; lymphocytes, 26 per cent.

March 26, 1913: vaginal smear showed occasional large round diplococci and thick bacilli.

March 3 and 7: 5,000,000 and 10,000,000 *Bacillus coli communis* were injected.

The patient came under my observation in February, 1913, having been referred by Drs. Isaac Adler and Leo Brooks Rosenthal. The patient was having about ten or fifteen movements a day. Her physical condition was as already described. There was nothing unusual, except that she had a narrow, flat chest and some enteroptosis. She had a scaphoid abdomen and was very much run down. She had a desire to move the bowels frequently, with a feeling of unfinished stool. Proctoscopic examination revealed the following picture: The mucous membrane was intensely red, of a granular appearance and covered with pus, mucus, and blood. This condition existed as far as we could reach with the sigmoidoscope, and the assumption was that it extended as far as the cecum.

Operation was advised, the idea being to put the colon at rest and effect an improvement or cure. On February 10, 1913, the patient was operated on.

Operation.—Lateral incision. Mobile cecum; Jackson's membrane; exceedingly long appendix. On account of the length of the cecal mysentery the dilatation of the cecum and the inflammatory condition of Jackson's membrane, involving the cecum, appendix, and ileum, the cecum was brought outside the abdominal wall with a portion of the ileum, and the ileum sutured on both sides to the ascending colon, so that subsequently, when it became necessary to close the opening, the septum between the ileum and ascending colon could be cut through, allowing fecal matter to continue from the ileum into the ascending colon. On account of pain, the cecum was opened on the second day after the operation, and a tube inserted. No fecal matter seemed to come through

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the ileocecal valve, so that an opening had to be cut subsequently into the ileum and a drainage tube inserted, after which the ileum drained continuously.

After the operation the patient's blood was examined by Dr. Rosenthal. The blood-count which he made on June 10, 1913, showed:

Hemoglobin, 70 per cent.; red-blood corpuscles, 4,800,000; white-blood corpuscles, 7200; polymorphonuclears, 76 per cent.; lymphocytes, 24 per cent.

There was no abnormal cell formation.

The stools were examined by Dr. Jeffries for the *amœba coli* and the bacillus of Shiga with negative results. Nothing was found but the ordinary bacteria which inhabit the intestines; that is, the bacillus coli communis, Gram-positive diplococcus, Gram-negative micrococcus, several bacilli, Gram-negative pus, mucus, and Wassermann was negative. Some sections of tissue removed from the rectal mucosa showed an acute inflammation with no disturbance of the relationship of the structures. There was an absence of necrosis, but some exudation in the space between the crypts, and many of the crypts were engorged with poly-nuclear cells. A large piece of the cecum and appendix was removed and sections were made at points selected by the writer.

The following is the report of Professor McFarland of the Polyclinic Laboratory:

Macroscopic.—Section of large intestine 10 c.c. in length. Mucous membrane deeply congested and appearing as such tissue frequently does after action of carbolic acid, arsenic, and some other poisons.

Microscopic.—Sections were made from six pieces removed at points indicated by Dr. Lynch.

Mucosa.—In nearly all sections the entire mucosa presents a picture of intense inflammation with hemorrhage into the tissue, and exudation. There has been no desquamation of epithelium or destruction of glands. The epithelial cells are well formed, and where hemorrhage exists it is in the interglandular tissue and not in the glands themselves. In the exudation are observed one or two giant cells such as are referred to in the description of the submucosa.

Submucosa.—Both acute and chronic inflammation may be seen. In one section are circumscribed areas of exudative substances that might be histologically described as tubercles, though not of tuberculous origin. In these are large giant cells with pericellular lymph spaces. The cells have numerous nuclei arranged in no definite manner but scattered throughout the cell substance. In another section is an area composed principally of blood corpuscles and plasma cells resembling the early stage of abscess formation. In another section adjacent to a solitary follicle is noticed a mass of dense fibrous tissue, cicatricial in character, which has materially disturbed the relationship of the mucosa at this point.

Solitary Follicles.—Numerous solitary follicles are seen, some extensively congested, others, but slightly. Several show hemorrhage into the gland substance.

Bloodvessels.—Many are normal. Some have extensive and acute inflammation so immediately surrounding them that the condition would seem to follow the course of the vessels. In one section some vessels exhibit acute arteritis.

Edema.—In some sections this is marked, in others not observed.

Muscular Coats.—In some sections the muscular coats are comparatively normal, some exhibit chronic inflammation with production, others round-celled infiltration of acute inflammation. A careful search between the muscular coats failed to reveal the presence of sympathetic ganglia or anything which could be regarded as a remnant of such.

Nervous Tissue.—Such as could be seen appeared normal. Sections were stained and examined for bacteria but nothing was added to the above findings.

Conclusions.—The sections examined presented a variety of pictures observed in various stages of acute and chronic intestinal inflammations of unknown etiology. The tubercles described suggest neither tuberculosis nor syphilis, and are of the nature of processes at times formed in low grades of inflammation.

Diagnosis.—Acute and chronic enteritis of unknown etiology.

Remarks.—Examination of the above tissue has additional interest since a section of intestine macroscopically the same, and from a patient exhibiting similar clinical symptoms, was

studied in this laboratory several weeks ago. For comparison
extracts of report are given: "There is extensive acute inflam-
mation involving the tissue from mucosa to peritoneum, even
the adjacent adipose tissue. Marked congestion with here and
there an area of hemorrhage is noted in the mucosa and sub-
mucosa. The mucosa is deficient in glands and is largely replaced
by masses of exudation. The exudate is largely made up of
fibrin and small round cells; plasma cells are few in number.
Such glands as remain are materially distorted. Many arteries
exhibit arteritis and periarteritis. At no place is there an attempt
at the formation of tubercles."

Returning to the original case, the bacteriological report was
as follows:

"Two tubes of foul-smelling serosanguineous pus, kept warm
during transfer from patient to laboratory, and one bit of tissue
were presented for examination. Pus was obtained from the
intestinal discharge; the tissue was clipped from the mucous
membrane of the large intestine. Before making cultures, hanging-
drop preparations on warm slides, India-ink preparations, and
smears stained in the usual manner, were examined. The bit
of tissue was seared and smear cultures made from fresh-cut
surface. Such a small particle was, however, available that in all
probability the cultures obtained were from bacteria on the sur-
face rather than in the interior. Both aërobic and anaërobic
cultural methods were resorted to and all plates incubated from
forty-eight hours to ten days, according to extent of growth and
condition of media. Culture media used included plain agar,
human blood agar, ascitic agar, glycerin agar, and sugar agar.
Of the organisms identified the bacillus coli communis, largely
predominated. A short slender bacillus and a large diplococcus
were not identified, though probably belonging to some of the
well-known groups of non-pathogenic bacteria found in the
intestine."

Conclusions.—No information of value is gained from the
above findings. What role may possibly be played by action of
bacterial toxins on the sympathetic ganglia of the intestine in the
case under consideration it is not within the province of the
present report to discuss.

For definite description of this particular form of enteritis the *Centralblatt für Bakteriologie*, from and including 1907, and numerous text-books on pathology and bacteriology have been unsuccessfully searched.

FIG. 124
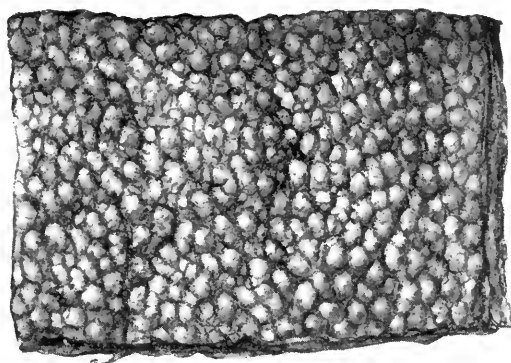
Acute hemorrhagic colitis. (Lynch.)

Etiology.—We have not entirely abandoned the hope of finding the bacterium which causes this disease. Comparatively little has been done on the bacteriology of the colon, and few bacteriologists are willing to be pioneers in this field. It must be admitted, that to isolate the etiological factor in any inflammation of the colon is a difficult problem. But more difficult tasks have been already accomplished, and there is no reason why this barrier should not be overcome by persistent search. In one particular case, and in others where we have had occasion to isolate the colon, it seemed as though the problem would be somewhat simplified with the exclusion of feces from the large bowel. In the case we have related, Professor Ewing was of the opinion that the trouble was due to some bacterium that came in intimate contact with the cell.

We propose to push the investigation of the bacteriology of this disease so long as we find a bacteriologist who is willing to work on the problem.

Diagnosis.—The diagnosis can be suspected when the patient complains of frequent diarrhea composed principally of blood,

mucus and pus. It can only be confirmed by a proctoscopic examination. (Fig. 124 is a drawing made from a piece of tissue removed from one of these patients, but it does not give any idea of the true picture of the disease.)

There is no other disease that the writer knows of that at all resembles hemorrhagic colitis. We have seen two other cases besides the one related. One recovered; the second case went to another surgeon for operation, because the radical operation that the writer suggested apparently frightened the patient. The third case is the one that has already been given. We know of two other cases occurring in the practises of friends. One underwent a colectomy and died shortly afterward; the other case disappeared from observation. Mummery's case died; so far as we know, our patient in the case reported above is the only one living and improving.

The most important points in the diagnosis of this trouble are frequent discharges containing large amounts of pus, few clots of blood, or blood and mucus, and a very pronounced odor.

Differential Diagnosis.—There are other diseases that must be considered, however, especially by those who are not very familiar with the use of the proctoscope. One is fungating carcinoma of the rectum or cecum. What are the differentiating points? Fungating carcinoma may, to the uninitiated, closely resemble hemorrhagic colitis in that there is a constant discharge of blood and mucus. We do not say that this occurs in every case; but there are cases where the discharge is so profuse that there is a constant stream of pus, blood, and mucus obscuring the view so that it is almost impossible to make a proctoscopic examination, or to tell whether the discharge is due to an inflammation of the mucous membrane or comes from a fungating tumor higher up.

The first point, of course, is the presence of a tumor. The second point is that if the colon is thoroughly irrigated the mucous membrane will be found healthy below the tumor. It is only the presence of this constant discharge covering the mucosa that might lead one to suppose that the case was one of hemorrhagic colitis. This we believe to be the point which will differentiate sarcoma from hemorrhagic colitis. It might be mistaken

for other inflammations of the rectum such as amebic dysentery and milder inflammatory conditions. From amebic dysentery it can readily be distinguished by finding the ameba or by the absence of the ameba. Similarly it may be distinguished from the bacillary form of dysentery. From other parasitic diseases of the bowel it is also differentiated by excluding the parasite.

Treatment.—We are absolutely convinced that the only rational treatment is *exclusion* of the colon. We cannot agree with Mummery and others who advocate appendicostomy or cecostomy. As soon as the feces are flowing over an already highly inflamed surface, no matter how many irrigations are given, it is impossible to get good results. Further, there is a constant increase in the bacterial supply by the presence of feces. Therefore the increased peristalsis and rapid passage of food through the bowel make it impossible for a patient to gain any headway against the disease. On the contrary, with the colon excluded, the patient settles down to a normal digestion, and the colon is treated as an abscess cavity and drained and irrigated on the same principle.

Since our large experience with ileostomy we are absolutely convinced that a patient can thrive and grow fat with an excluded colon. All the cases that we have had under observation, where the colon has been excluded, have gained in weight varying between ten and twenty pounds. The best evidence in support of our theory is the fact that the only case we know of that is recovering has had her colon excluded. All cases where minor operations or major operations (such as removal of the colon) were performed have died. After the colon has been excluded, the patient is put on a regular diet and allowed to eat anything and everything, depending on his or her fancy. After the first month or so the patient is but slightly inconvenienced by the presence of the iliac anus. Formed stools are the rule, one or two movements daily, and in the interval very little inconvenience is experienced. We have been in the habit of asking our patients to wear a bag, which we have had specially made and which is very well adapted to this opening. A description of this opening is given by Tieman.

Medical Treatment.—We have tried innumerable remedies, but the one that has given the most satisfactory results has been irrigations with hydrogen peroxide, and sometimes after that the injection of a solution of subnitrate of bismuth suspended in Zoolak half an hour after washing the colon. Argyrol, permanganate of potassium, ichthyol, gelatin, ordinary salt solution or nitrate of silver, and other remedies have been used, but none have given as good results as the bismuth. When the solution fails to pass through the colonic opening into the transverse colon, on account of spasm, the patient should be put in the knee-chest position and the irrigation given through the rectum.

Complications.—As with all anemic patients, wandering pains occur from time to time. There are usually some crampy pains after irrigation. The most curious phenomenon that we have experienced (and it applies to all cases in which the colon has been excluded, regardless of the pathological lesion in the colon) is a feeling of weakness, sometimes lasting half an hour, with very rapid pulse, 130 to 140, and respirations about 40. These spells occur from time to time in all patients with excluded colon. There is nothing in particular to do for these weak spells except to have the patient lie down and rest until it passes away. At first these spells are rather alarming, both to the patient and the physician; but in none of our cases have they caused the patient anything but a temporary inconvenience.

CHAPTER XX.

FIG. 125   FIG. 126

THE importance of diverticula of the colon is almost exclusively connected with that variety known as multiple or acquired diverticula of the sigmoid flexure. These diverticula may occur anywhere throughout the large bowel, save perhaps the rectum, but the sigmoid flexure is the situation where they occur in a very large proportion of all cases. They give rise to such an important series of pathological processes and clinical symptoms as to make their study of first importance to an operating surgeon.

Historical.—Prior to 1898 the condition, for all practical purposes, was unknown. Specimens were shown at medical meetings as pathological curiosities, and descriptions of such isolated cases can be found scattered throughout the medical literature, especially the transactions of learned societies, of the past fifty or sixty years. That such diverticula were of clinical importance was almost entirely overlooked until, in 1898, Graser in Germany drew attention to the fact that a chronic stenosing inflammation of the bowel not infrequently occurred as a result of their presence, and caused many cases to be mistaken for carcinoma. American investigators then took the lead and demonstrated the relationship of these hernial protrusions to certain cases of peritonitis and other acute inflammatory conditions in the abdomen, but these observations were not collated and summarized to enable general conclusions to be drawn. In 1898 an investigation of practically all the recorded cases was made by Dr. Telling and the connection between the various pathological processes and the observed clinical symptoms clearly established. That study has furnished the basis of all subsequent investigations on the subject, and since that date a very large number of cases have been recorded by operating surgeons and pathologists all over the world. As a result multiple diverticula

of the colon are proved to be of comparatively frequent occurrence and to be of such importance clinically that no surgeon who is unaware of the pathological processes to which they give rise and the various ways in which their presence may be concealed can claim to be fully competent to investigate an acute abdominal lesion ganate or potassium, ichthyol, gelatin, ordinary salt what he tal nitrate of silver, and other remedies have been used,

Anatomy.—The diverticula occur in two groups of cases which require separate study. In the first and larger group the diverticula occur in various stages of development, varying greatly in size and number, but without any of the so-called secondary pathological processes having resulted from their presence.

The second and smaller group includes all those cases in which various secondary pathological processes of varying degree and importance have occurred; and this group may be further subdivided into those cases in which the pathological processes have given rise to clinical symptoms during life and those in which the condition has remained entirely latent and unsuspected, to reward the morbid anatomist who makes a systematic examination of the large bowel (a frequently neglected proceeding) at every autopsy.

A point of great interest in the study of these diverticula, and one upon which the writer has always laid much stress, is the way in which this progressive method of study shows the close connection between every described pathological process and the various symptoms observed during life. To make our meaning clearer, it is obvious to every close observer of the uncomplicated group of cases that these diverticula might be expected to possess a "secondary" pathology of ulceration, perforation, proliferative thickening, etc. All these conditions are found to exist, and that existence once being realized, it follows that such happenings must frequently be attended by symptoms of very various kinds during life; and here again clinical observations have fully borne out such observations.

It is of the first importance, therefore, to understand the anatomy of the uncomplicated diverticulum.

The diverticula are usually multiple, though a single diverticulum has been found in a few instances. Their number varies

from one up to many hundreds; an ordinary specimen presents from fifteen to fifty diverticula. They may occur anywhere throughout the large bowel, from the cecum to the commencement of the straight portion of the rectum. Examples apparently

Fig. 125
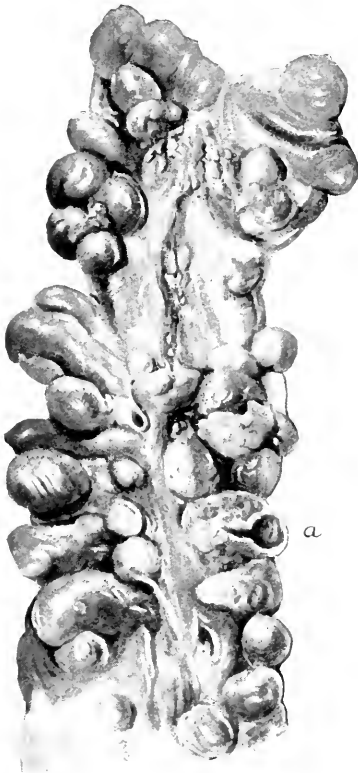
Fig. 126

Diverticula of sigmoid. The fat has been dissected from the outer aspect of the bowel. The pouches for the most part enter the appendices epiploicæ. One of the sacs is laid open at *a*.
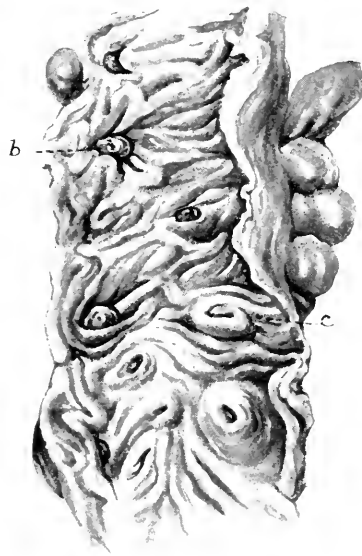
Inner surface of the bowel from the same specimen. A concretion is seen at *b* presenting at the orifice of one of the diverticula. At *c* the lipped orifice is clearly shown.

of the kind under description have been noted in the vermiform appendix. In the great majority of all cases, however, the diverticula are limited to the sigmoid flexure, especially about its lower third. They cease abruptly at the commencement of the rectum, and usually diminish in size and number as one proceeds

up the bowel, to disappear in most cases before the end of the descending colon is reached. In some cases they extend up this portion of the bowel for a considerable distance and may even be traced uninterruptedly back to the cecum. More commonly,

FIG. 127
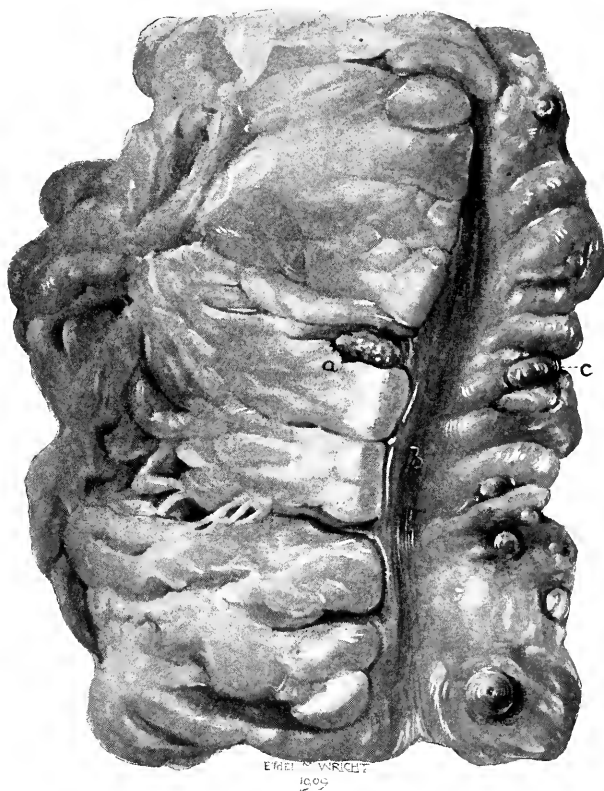
Diverticula of sigmoid showing enteroliths. The abundant fat has been dissected from half of the bowel showing the pouches which enter the appendices epiploiae. At *a* a single pouch has been dissected out and shows how they are buried in fat and liable to pass unrecognized unless specially sought for; *b*, longitudinal muscular band; *c*, a concretion.

however, they tend to "reappear" at the splenic flexure and cecum, with intervals of healthy bowel in between. In some instances their incidence has been limited to the cecum and such cases may be of great clinical importance.

They will be described as they occur most typically, viz., in moderate numbers in the lower third of the sigmoid flexure (Fig. 125). The sigmoid loop in which the diverticula are found is frequently loaded with fat which entirely conceals the hernial protrusions, more especially as these are mostly into the epiploic appendages. Even when fat is present only in moderate amount the condition is easily overlooked by anyone not familiar with

Fig. 128
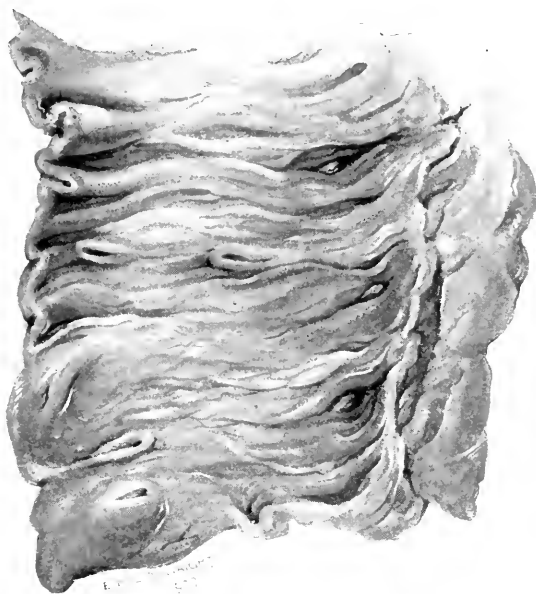
Sigmoid showing diverticula. Inner aspect of gut. Normal but rugose mucosa. The orifices show well-marked lipping and concretions protrude partially from some of the pouches.

the characteristic appearances. The concealment of the diverticula by fatty tissue is well seen in Fig. 127. If there is little fat, or if what exists be dissected from the diverticula, these appear as rows or clusters of globular or flask-shaped protrusions (Figs. 125, 128, and 132). These diverticula occur mainly in two rows, either at the sides of the gut or close to the mesenteric attachment; more rarely on the convexity. Perhaps the commonest situation is in the appendices epiploicae. In many cases

they are confined to them and then generally present a double
row of symmetrically placed, hollowed-out "pockets." In other
cases none are so situated. Frequently some of the diverticula
enter the appendices and some lie outside them. This special
favoring of the appendices epiploicæ is accounted for by the fact
that the point of their attachment to the gut is a *locus minoris
resistentiæ*. In a majority of cases the affected appendages are,
or have been, filled with a large amount of fat. Bland-Sutton
has stated, and illustrated by diagrams, that this fat is directly
continuous with the subserous fat. If there is the slightest ten-
dency to the formation of diverticula it will readily be seen that
the soft, fatty tissue of the appendix forms a point of lowered
resistance.

FIG. 129
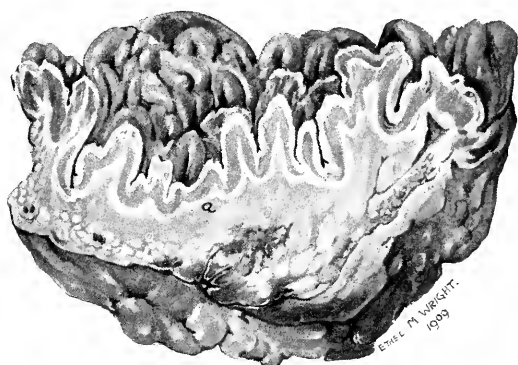
Peridiverticulitis, with great thickening of the gut wall causing stenosis and
simulating carcinoma, for which it was mistaken when resected at operation.
The thickening due to fibrosis is seen at *a*.

The diverticula vary in size usually from a mere macroscopic
visibility to that of a hazel-nut. A larger size than this is seldom
attained, as secondary changes generally occur, leading either to
detachment or ulceration, abscess, or peritonitis. When small
they are semi-globular; as they increase they become more oval
or flask-shaped, the aperture in the gut wall usually being smaller
than the maximum diameter of the diverticulum (almost con-
stantly so when they enter the appendices epiploicæ). This is
an anatomical point of great importance in regard to the causation
of inflammation in them. In those diverticula which do not

enter the appendices epiploicæ the aperture may be relatively
large. A well-marked case of the kind is illustrated in Figs. 125
and 127. A single diverticulum has had the fat dissected from
it. If the mucous surface of the gut be inspected the orifices of
the sacs can usually be seen as small, round or oval and lipped
openings (Figs. 126 and 128). Not infrequently, however, these
openings are concealed by an unduly rugose mucosa and they

Fig. 130
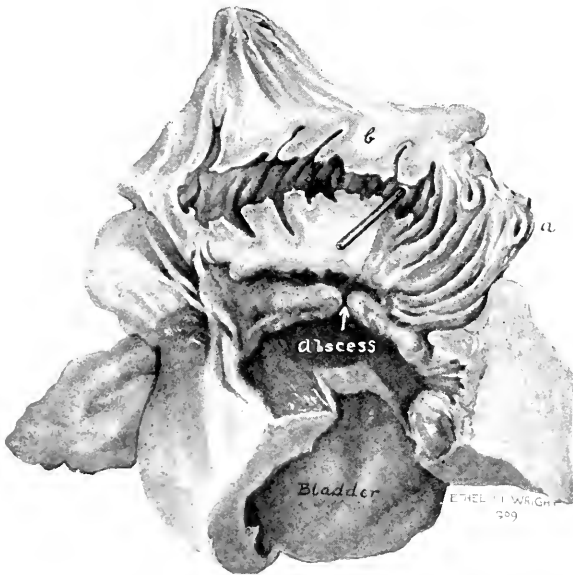
Chronic peridiverticulitis, with thickening and stenosis of the gut wall, simulating
carcinoma. There was adhesion to the small intestine causing chronic obstruction
to the bladder. There were several small chronic abscesses in the neighborhood,
the largest between the bowel and the bladder. The thickening of the gut is seen
at *b*, and the lipped orifice of a diverticulum at *c*.

have to be specially searched for with a probe. In proportion
as secondary chronic inflammatory changes develop the rugosity
tends to become more marked and the presence of diverticula is
more difficult to detect. This is illustrated in Fig. 129. The
diverticula mostly contain fecal material, either soft or, more
usually, concretions of varying degree of hardness. In some in-
stances when the gut is stretched open these concretions can be

seen protruding slightly from the orifices of the diverticula (Fig. 126).

Etiology.—The causation of these diverticula has been a subject of much uncertainty and discussion and the reader is referred to the writings of the various authors who have made research in the matter. At the present time, however, it may be taken as proved that the formation of these diverticula is favored by:

1. Any increase of pressure within the bowel.

2. Any weakening of the muscular tone of the bowel wall as a whole.

3. Any causes which bring about specially weak spots in the bowel wall through which a hernial protrusion might take place.

Probably several of the causes are present in a given case and together permit the formation of diverticula.

1. **Increase of Pressure Within the Bowel.**—This cause is certainly the most frequent and the most important. Constipation and the accumulation of fecal material at certain points will undoubtedly tend to distend the bowel: this explains their special incidence at the "delay points" of the colon, *e. g.*, the cecum, splenic flexure, and in particular the sigmoid flexure. Their absence from the rectum is probably due to the absence of appendices epiploicæ from this part of the bowel and to its being provided with a stronger musculature.

But not only is the loading of the bowel with feces, such as occurs in habitual constipation, such a potent factor, but *distention of the bowel with gas*, a very frequent concomitant condition, undoubtedly exercises a marked influence and doubtless explains the majority of those cases which occur in individuals in whom no marked constipation existed. Indeed, the writer's impression becomes stronger that the flatulent element is the more marked of the two in initiating the condition, though the coprostasis is undoubtedly of great importance in setting up secondary pathological processes.

2. **Weakening of the Musculature of the Bowel.**—This is a very frequent accompaniment of old age and it is therefore not surprising that the vast majority of examples of the condition occur in old or even aged subjects. The condition is rare under forty, though it has been described in early adult life and recently in a

child of five. An interesting fact which the writer pointed out as the result of a study of a large number of cases was that the average age of those cases which were accompanied by clinical symptoms was lower (fifty-five years) than those in which the condition was latent (sixty-seven years). The explanation is probably to be found in the fact that progressive atony of the bowel is the dominant factor in the "senile" group, while flatulent constipation is the determining agent in the younger or "clinical" group.

The Influence of Obesity.—A majority of the diverticula occur in sigmoid flexures which are loaded with fat (Fig. 127), as has already been noted. This fat acts in two ways, by bringing about a general weakening of the musculature and by providing a series of spots of lowered resistance to pressure from within, especially opposite the appendices epiploicæ, in which the majority of the diverticula occur. Bland-Sutton has shown that the fat of the submucous coat is directly continuous with that of the appendices epiploicæ and so exerts a directly predisposing effect on these hernial outpushings.

3. **Causes of Local Weakness in the Bowel Wall.**—In addition to that mentioned in the preceding paragraph, attention has been drawn to the relative weakness at the point of perforation by the vessels. Much has been made of the congestion of these vessels in cases of chronic heart disease, etc., as factors in giving rise to the hernial protrusion. But at most these are probably but subsidiary causes and are of importance in but a few of the cases.

Secondary Pathological Processes.—In the foregoing anatomical description of diverticula uncomplicated by any secondary changes it must have been apparent that the condition is full of potentialities for evil. Given a series of pockets resulting from relative weakness in the bowel wall and containing fecal material (and of course in some cases foreign bodies), one could almost forecast the various lines of pathological development which these diverticula might follow; and one must of necessity be impressed with the fact that such pathological development can take place along two main lines and as a result of two entirely different causes, viz., (a) *a mechanical factor*, and (b) *a bacterio-logical or toxic element*. With regard to the mechanical factor one

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has only to realize what has now been established beyond doubt, that the great cause of the diverticulum formation is increase of pressure within the lumen of the bowel acting upon a relatively weakened wall, in order to understand that once a diverticulum has been formed it will probably contain feces, and that such fecal mass will tend to increase in size. If it be not periodically expelled it will tend to inspissate. Such a mass inside the diverticulum will act as a *point d'appui* for pressure in the bowel from within outward. The mechanical results, therefore, will be a tendency to progressive enlargement and consequent thinning of the sac wall. Then either *pari passu* with the progressive enlargement, or at any later time, the bacterial and toxic factors will come into play. Any fecal mass is a nidus for a bacterial flora varied in kind and in virulence, and the presence of this, combined with the mechanical irritation of the concretions, will lead to inflammatory reactions of varying kinds. If the organisms be of low activity a subacute or chronic inflammatory reaction might be expected to occur. This would lead to fibrous hyperplasia, with the usual result of contraction of the new-formed fibrous tissue. If the organisms be of high virulence inflammation and ulceration of an acute or even gangrenous character may occur; or, in milder cases, ulceration and chronic local abscess formation.

One may summarize these considerations and say that the "secondary" pathology of these diverticula is brought about by the following agencies:

  1. The thinning of the diverticulum wall.
  2. The ulceration of the mucosa.
  3. The perforating action of the retained concretion.
  4. The presence of microörganisms and their toxins.
  5. The inflammatory reactions of varying type and degree.

One can scarcely fail to note the great resemblance between these agencies and those contributing to bring about the various types of ordinary appendicitis. Indeed, the parallel is a very close one, for the condition under consideration, when it gives rise to trouble, is usually some form of *epiploic appendicitis* and there is a more or less complete mimicry of the inflammation of the vermiform appendix on the right side of the abdomen; and as

happens in ordinary appendicitis, the inflammation may either subside, prove recurrent, lead to local abscess formation, or give rise to acute peritonitis of variable virulence and seriousness. In fact, the records of these cases go to show that general peritonitis from this cause has been overlooked in a way that reminds one of the days when ordinary appendicitis was not generally recognized as one of the causes of general peritonitis. Ordinary appendicitis is more frequently perforative, while epiploic appendicitis tends very much to assume the chronic, hyperplastic type, but the difference is one of degree only, allowance being made for the frequency of multiple lesions in the case of the acquired diverticula.

We are now in a position both to enumerate and to appreciate the various secondary pathological processes which actually occur in, or as a result of the presence of, these diverticula. They are as follows:

1. Infection of the general peritoneal cavity from thinning of the sac walls without perforation.

2. Acute or gangrenous inflammation of the sac—"diverticulitis."

3. Chronic proliferative inflammation with thickening of the gut wall and subsequent stenosis of the bowel—"peridiverticulitis."

4. The formation of adhesions between the sigmoid loop and other viscera, in particular adhesions to

    (*a*) the small intestine;

    (*b*) the bladder.

5. Perforation of the diverticula giving rise to

    (*a*) acute general peritonitis;

    (*b*) local abscess;

    (*c*) submucous fistulæ of the gut wall;

    (*d*) fistulous communication with other viscera, notably the bladder.

6. The lodgement of foreign bodies in the diverticula.

7. Chronic mesenteritis of the sigmoid loop.

8. Local chronic peritonitis.

9. Metastatic suppuration.

10. The secondary development of carcinoma.

11. Perforation into a hernial sac.

12. The formation of loose bodies in the peritoneal cavity.

Some of these pathological processes are of relatively small importance, being of but very occasional occurrence. Some, from their frequency, demand our closest attention.

Infection of the General Peritoneum.—This has occurred without actual perforation of the sac. Sometimes the sac is so thin from atrophy of its muscular and mucous layers that the fecal contents can be seen through the serous covering. It is not surprising, therefore, that infection can in this way pass over into the general peritoneal cavity. Very frequently, however, a low form of inflammation has existed in one or many of the sacs for a considerable period and then suddenly a more active and acute (or even gangrenous) inflammation may develop, in one or more of them. In this we have a reproduction of what occurs so often in the right iliac fossa in ordinary appendicitis.

Acute Inflammation: Diverticulitis.—Beer rightly draws a great distinction between diverticulitis and peridiverticulitis. In the former group of cases the essential lesion is in the mucosa, and we have acute and gangrenous inflammation, perforation and septic peritonitis as the usual sequelæ. In the peridiverticulitis cases the fibrous hyperplasia results from bacteria, or more probably their toxins, soaking *through* the mucosa into the submucous coat and without there being of necessity any ulcerative or inflammatory lesion of the mucosa itself. Such mucous ulceration may exist, but when present is undoubtedly of late origin, long after the fibrous hyperplasia has reached a considerable degree. Possibly also it is itself secondary to the increasing hyperplasia (and consequent stenosis—see page 368), as a result of which fecal material is forced into the pouches under greater pressure.

Chronic Inflammation: Peridiverticulitis.—This is one of the most important and characteristic results of the secondary pathological processes in these diverticula; it is essentially a chronic proliferative inflammation of the submucous and serous coats resulting from the local absorption of bacterial products as explained above. Of all the secondary results this is probably the most frequent, and though when present in any marked degree

it is the most obvious because it leads to the formation of a definite tumor, its true nature had been entirely overlooked prior to 1898, when Graser first described an example, thereby opening up the whole subject of diverticulum formation in the large bowel. This proliferative inflammation tends to surround the rows of diverticula and the bowel with a thick mass of fibrous tissue, the result of which is that the fusiform sacs are elongated into very narrow and tortuous channels. The great thickness of the inflammatory mass is shown in Fig. 129. In some cases the wall has been nearly two inches thick in places. This proliferative inflammation involves the whole circumference of the bowel for a varying distance (2 to 8 inches as a rule), and besides giving rise to the formation of a definite tumor, the inevitable contraction of the new-formed fibrous tissue leads to a slowly progressive stenosis of the bowel.

The diverticula themselves are buried in a mass of tough fibrous tissue which very frequently becomes adherent to adjacent viscera. This leads to one of the most important results—the *mimicry of carcinoma*. This mimicry is both pathological and clinical. The pathological imitation of carcinoma is close, but there are certain features which should raise suspicion in the mind of a careful observer or of one familiar with the condition. It is not surprising that the surgeon, on opening the abdomen and seeing such a tumor of the sigmoid loop, should regard it as carcinoma, considering the relative frequency of malignant disease in this region. Up to comparatively recent times such a tumor has almost invariably been dealt with under this mistaken diagnosis, and if resection has been performed the tumor has often been cast aside without further question as to its malignant nature: such specimens not infrequently have been placed on museum shelves labelled "carcinoma." If, however, a section of the specimen is made, the elongated diverticula appear merely as fine lines, and it is not surprising that their presence is not recognized unless a similar specimen has come within the observation of the operator. The writer is of opinion that up to 1908 he had not come across any such specimen on a museum shelf or in the hands of one who was unfamiliar with the condition in which the fact had been recognized that these diverticula were present

and were the true cause of the inflammatory mass. If not labelled "carcinoma" they are usually put up as specimens of "simple inflammatory stenosis." If a resected specimen is cut into immediately after removal from the body the condition of the mucous membrane is noted to be different from what obtains in most examples of malignant stricture. In carcinoma there is usually fungation or ulceration of the mucous membrane. In the majority of cases of peridiverticulitis ulceration of the mucous surface of the gut does not occur. Owing to the circumferential contraction of the gut, however, the mucosa is very unduly rugose, and these rugæ effectually hide the narrowed orifices of the diverticula, which in consequence have to be searched for, carefully and minutely, with a fine probe. The author's observations have led him to the conclusion that the greater the inflammatory thickening the smaller are the orifices of the diverticula and the narrower are their channels; it is probable that the formation of fibrous tissue tends to elongate and narrow them. In such specimens they exist frequently as long (from half an inch to one inch), narrow, and often tortuous channels.

It is not too much to say that no case of stenosis of the sigmoid flexure can be accepted as being carcinomatous in origin without close and patient scrutiny of the tumor, which is all the more necessary in that the exact operative proceedings may be considerably modified as a result of the conclusions thereby arrived at.

The Formation of Adhesions.—As has been stated, it is quite obvious that adhesions of the affected portion of the gut will be extremely likely to occur; in fact, their presence is the rule. The fact that the sigmoid loop has a fair range of mobility will permit the formation of adhesions in various situations. They are formed in the course of the slower inflammatory processes and will, of course, be protective; they will tend to prevent perforation or, if that occurs, to limit the abscess and prevent infection of the general peritoneum. But much will depend on the stricture to which adhesion takes place and on whether abscess or fistula formation occurs at the same time. It is necessary to emphasize the special importance of two varieties of adhesion.

(*a*) *Adhesion to the Small Intestine.*—The sigmoid flexure and small bowel may become mutually adherent at almost any point

of the latter. This adhesion may not be productive of any important results, but does sometimes lead to obstruction of the small bowel. In one case a loop of small gut had been caught in the pelvis and acute kinking had been produced, with acute obstruction as a result. The adhesion to the sigmoid was noted at the time of the operation, but the diverticula, which were present in numbers, were overlooked and discovered only at the autopsy. In a second case (a patient of the writer's), chronic obstruction of the small intestine was diagnosed, and at the operation this was found to be due to a partial obstruction as the result of adhesion to a large mass involving the sigmoid flexure (specimen shown in Figs. 130 and 131). The nature of the sigmoid

FIG. 131
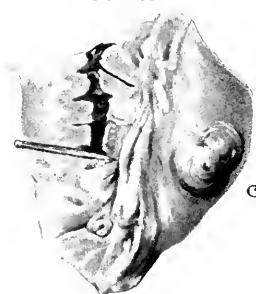
The rod is inserted into a diverticulum which is seen at *c*, the fat having been dissected from it.

mass was not recognized until the autopsy. In a case on the shelves in the museum of one of the London hospitals the inflamed diverticula had become adherent to the cecum and had led to the formation of a band over which some seven feet of ileum had become acutely obstructed.

(b) *Adhesion to the Bladder.*—But perhaps one of the greatest revelations which the study of these diverticula has made lies in the further light which is thrown upon our knowledge of vesicosigmoid fistula. From the anatomical disposition of the parts it is obvious that adhesion between a peridiverticulitis of the sigmoid flexure and the bladder will be likely to occur. When it is remembered that the sigmoid flexure is prone to become adherent by the end of a pouch which has fecal contents, and

which pouch may at any time become perforated and give rise
to a suppurative process between the inflammatory sigmoid mass
and the bladder wall, it is not surprising that a fistulous com-
munication between the two viscera should occasionally result.
This fistulous communication is often a narrow and tortuous
tract which tunnels through a considerable thickness of inflam-
matory fibrous tissue. Up to now records of cases of such fistulæ
of undoubted diverticular origin have been scanty. In 1908
it was possible to enumerate only eleven cases. One of these
was discovered on a museum shelf, the diverticular origin of the
fistula not having been recognized; the fibrous tissue intervening
between the bladder and the bowel wall was some two inches
thick.

Perforation of the Diverticula.—From the ulceration of the wall
and the pressure from within this will necessarily be a frequent
result. But the results of such perforation will be very different
according to (1) the acuteness of the ulcerative process; (2) the
amount of chronic inflammatory thickening present; or (3) the
presence of adhesions. These factors determine whether the
perforation will lead to (*a*) general peritonitis, (*b*) local abscess
formation, (*c*) submucous fistulæ, or (*d*) fistulous communication
with other viscera, notably the bladder, as described above.

General perforative peritonitis is recognized with increasing fre-
quency as being due to perforation of a diverticulum and raises
the pathology of these structures to a position of first importance
in a study of the "acute abdomen."

Local abscess formation is frequent. There may be several
small abscesses shut off by thick adhesions, or a single large
abscess which determines the clinical picture. The abscess may
be intra- or extraperitoneal and may lead in turn to fistulous
communication with the external surface, with the bladder, or
with the bowel.

Submucous Fistulæ.—A condition that has been noted in some
of the cases with much inflammatory thickening is that ulceration
of the interior of several sacs leads to the formation of several
small abscesses. These abscesses tend to burrow through the
thickened tissues and to form submucous *fistulous communi-
cations with each other;* there may be a labyrinth of such tracks.

They may reënter the lumen of the sigmoid flexure or communicate with a peritoneal abscess cavity by one or several openings. This suppurating process is usually exceedingly chronic and gives rise to great thickening, adhesion, and tumor formation, with possible sequelæ in the shape of obstruction of the small intestine or perforation of the bladder.

The Lodgement of Foreign Bodies in the Diverticula.—Any foreign body that is contained in the feces will be liable to enter a diverticulum along with more or less fecal material. The lodgement of such foreign bodies will provide added risks with regard to ulceration and perforation of the sacs, with consequent local abscess formation or general peritonitis. A number of these interesting cases are on record, Sir John Bland-Sutton in particular having drawn attention to their existence.

Sigmoid mesenteritis tends to produce contraction of the sigmoid loop, adhesion of its limbs, and, as secondary results, various forms of twisting, kinking and volvulus in this portion of the bowel. With regard to the diverticular origin of these lesions Ries says: "It is safe to prophesy that this association of diverticula and meso-sigmoiditis will frequently be discovered in the near future." Any case of this kind discovered at operation merits special investigation, therefore, from this point of view.

Local chronic peritonitis in the neighborhood of the sigmoid loop has frequently been traced or ascribed to the presence of diverticula, and probably with much truth, though there are other causes for chronic peritonitis in this neighborhood.

Metastatic suppuration in the liver has occurred in one instance, and *perforation into a hernial sac* on one occasion. An infrequent though an extremely interesting secondary result is the *development of carcinoma* secondary to the irritation of inflamed diverticula. Hochenegg established this beyond doubt, and in one or two other cases the carcinoma and diverticula have coexisted in such a way as to render it probable that the carcinoma was secondary. It is conceivable, however, that when diverticula occur only above the malignant stricture the progressive occlusion of the bowel may have been directly responsible for their formation. The *formation of a loose body* in the peritoneum is an occasional and interesting happening; such a body in the

process of detachment is seen in Fig. 132. In this case an identical concretion was at the same time found lying free in the pelvis.

Fig. 132
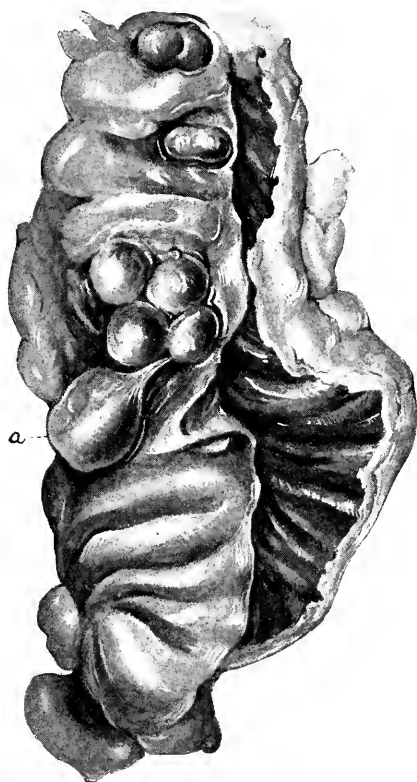
Diverticula of sigmoid. The fat has been partly dissected from the outer surface of the gut, showing several pouches. At *a* is seen a larger one containing a calcareous concretion with a thin fibrous pedicle in the process of separation to form a loose peritoneal body. A similar concretion the size of a bean was free in the pelvis.

Clinical Aspects.—When the anatomy of the uncomplicated diverticulum has been studied and the various secondary pathological processes that occur in connection with it, it is easy to forecast the clinical symptoms to which these secondary processes will give rise. A study of a large number of cases has enabled a fairly definite clinical classification to be made out. It will readily be appreciated that no classification of this kind can

be rigidly insisted upon, but it will be found convenient in actual practice to bear in mind that which is given below. It is obvious that in each of the groups the differential diagnosis must frequently be difficult and often impossible, and that in most of them there is a host of other pathological conditions which can give rise to the same symptoms. But in one group (4) certainly the diagnosis of diverticulitis is more probable than any others; the first group is so characteristic that the possible presence of diverticula can never be ignored.

These clinical groups are:

1. Inflammatory trouble, more or less acute, in the left lower region of the abdomen. (So-called left-sided "appendicitis"; sigmoiditis; perisigmoiditis; epiploic appendicitis; diverticulitis; peridiverticulitis; pericolitis sinistra, etc.)

2. Perforative peritonitis.

3. Intestinal obstruction.

4. Vesicocolic fistula.

5. Inflammatory trouble in the right iliac fossa or its neighborhood.

1. **Inflammatory Trouble in the Left Iliac Fossa.**—Cases of this type constitute a large and important group and, as has already been said, many of them are clinically identical with the various types of inflammation of the vermiform appendix, except for the fact that the trouble is on the left side. So strong is the resemblance that in one case recorded by Bland-Sutton the question of transposition of viscera was carefully considered prior to operation. Diverticulitis is not by any means the only cause of inflammatory signs and symptoms in this quadrant of the abdomen and when a case presenting such phenomena comes under observation there are several questions which the clinician will desire to have answered. They are:

(*a*) The frequency of diverticulitis as a cause of such symptoms, compared with other causes.

(*b*) The other causes which may give rise to confusion and the criteria for differential diagnosis.

(*c*) The modification of treatment, if any, which becomes necessary if the diagnosis of diverticulitis becomes certain or at least highly probable.

Frequency.—This is such as to make the study of these cases absolutely necessary. One has only to refer to the surgical literature of the last four years to be impressed with the number of these cases which occur: it is the history of appendicitis over again, though on a scale of less magnitude.

Differential Diagnosis. — This is usually difficult. There are numerous other conditions which give rise to inflammatory trouble in this neighborhood. The chief ones are:

Sigmoiditis.

Ordinary appendicitis, with left-sided symptoms.

Pelvic inflammations.

Ovarian strangulation with inflammatory changes.

Actinomycosis of the sigmoid flexure.

Syphilitic and tuberculous pericolitis.

Dysentery.

This does not exhaust the list of possible causes of error but at least includes the most important.

With regard to the differential diagnosis between diverticulitis and sigmoiditis, or the cases that are so labelled, there is great difficulty inasmuch as the term sigmoiditis is used so differently by various observers. In the term sigmoiditis many include mere catarrhal and functional disturbances of the sigmoid loop, while others restrict the use of the term to cases in which there are actual inflammatory changes of the bowel. Of these latter cases two well-marked types occur. In the first the inflammatory changes are acute and do not involve the whole thickness of the bowel, readily yeilding to treatment by purgation and enemata. In the second the whole thickness of the bowel is involved and the cases may be acute, subacute, or chronic, and may be accompanied by perisigmoiditis. There may be fever; local signs may be very marked; tumor formation and suppuration may occur. With regard to this last group of cases much remains to be cleared up. It is certain that in the past the majority of writers on sigmoiditis and perisigmoiditis have completely ignored the existence of these diverticula. This could scarcely have been possible had they been aware of their existence. On the other hand, there is practically a consensus of opinion among authors who have had practical knowledge of diverticulitis that

most, if not all, of these more serious cases of sigmoiditis are due to the presence of these diverticula.

Actinomycosis and dysentery can usually be differentiated by examination of the stools. In syphilis a Wassermann test and in tuberculosis one of the reactions with tuberculin will usually help. Moreover, the diagnosis in these cases is often supported by many other considerations. A vermiform appendix may be felt, by rectum or vagina, passing transversely across the pelvis; congenital malposition of the cecum is a remote contingency.

Clinically, the age of the patient has a great bearing on diagnosis and one should hesitate very much in making a diagnosis of diverticulitis in a patient under forty years of age, though Fiedler has described a well-marked case at twenty-two years, and diverticula with secondary inflammation have been noticed in one instance at the age of five years. A striking feature in cases of diverticulitis is the tendency to the formation of tumor and abscess. Of 63 cases a tumor was felt in 20, and abscess formation occurred in 23, though such abscess formation did not invariably give rise to palpable tumor. The foci of inflammation and suppuration may be multiple and of a very chronic nature, frequently causing no rise of temperature and often but little pain. In cases of sigmoiditis a tumor is often felt. It is elongated, sausage-shaped, tender, and often ill-defined. It may be movable or fixed, lying a little above Poupart's ligament (frequently parallel with it). After the occurrence of abdominal symptoms referable (more or less definitely) to this quarter of the abdomen this swelling may be made out. It may disappear rapidly or gradually, or may increase with signs of pus formation. If we adopt the view, which is steadily gaining ground, that most of the serious and protracted cases of sigmoiditis owe their origin to the presence of diverticula, it will be seen that when such symptoms as the above occur in a patient of or above middle age, and who has been the subject of marked or former constipation or intestinal flatulence, a diagnosis of diverticulitis possesses a great degree of probability.

Modification of Treatment.—The most important modification—one that becomes the more insistent as the diagnosis of diverticulitis becomes the more probable—is the necessity for operation.

One reason is the great risk of the development of complications such as suppuration and perforative peritonitis which these diverticula tend to produce.   To this there is added the certainty that the condition will not subside of itself but will be likely to progress and to do still further mischief.   Operation, therefore, should be undertaken as early as possible; and at such operation the possible multiple nature of the lesions should be borne in mind.

2. **Perforative Peritonitis.**—There is often very little that is distinctive about the peritonitis which occurs from perforation of these diverticula other than the preceding localization of the inflammatory trouble to the left quarter of the abdomen in some cases.   A very interesting clinical point, however, is the liability of the diverticula to be ruptured during any sudden strain, probably as a result of the presence of hardened concretions within the sacs.   Straining at stool has produced such a result; this is not surprising seeing that the pressure in the sigmoid flexure is then probably increased.   Perforative peritonitis supervening on such an act would therefore render the presence of diverticulitis at least possible in a patient of the requisite age.

Patel has recently devoted special attention to the study of these cases and, while admitting that a certain diagnosis can rarely be possible, he thinks that the mode of onset and type of the peritonitis are frequently suggestive of a diverticular (or, at any rate, a sigmoid) origin.   This should lead to an examination of the sigmoid region first and thus possibly effect some saving of time in a class of cases in which time saved at operation is a valuable point in treatment.

He separates the cases of perforative peritonitis from this cause into two main groups, the *asthenic* and the *sthenic:*

Perforating Sigmoiditis with Asthenic Peritonitis.—This variety has not, properly speaking, a clinical history but is characterized by the almost complete absence of peritoneal reaction, the latency of its onset and progress, the insignificant rise of temperature and the rapid onset of symptoms of collapse.   In some cases the possibility of an abdominal condition is not thought of, but rather, with a slight rise of temperature, one suspects some pulmonary complication.

One cannot hope to formulate any diagnostic criteria for these cases, which resemble the terminal peritonitis occurring in tuberculosis or malignant disease of the intestine or in various cachectic conditions.

Perforating Sigmoiditis with Sthenic Peritonitis.—In these cases there are definite signs which clearly indicate that the seat of trouble is in the abdomen and several types can be recognized.

(*a*) *Fulminating Type.*—An interesting and typical case is recorded by Mickle, in which a man of forty-five, after taking a purgative, was suddenly seized with severe pain in the abdomen, with rapidly increasing signs of peritonitis, leading to death in twenty-four hours.

(*b*) *Acute Type.*—This is much the commonest type and in its general features resembles the acute peritonitis resulting from the perforation of any abdominal viscus. The onset is by a sudden attack of abdominal pain which is usually in the lower half of the abdomen and sometimes definitely in the left iliac fossa, but the localization is less constant than in the corresponding cases of perforation of the appendix on the right side of the abdomen. The pain may be in the mid-line, or even exactly at the umbilicus, or on the other hand it may be generalized, possibly localizing itself after an interval. Unless surgery intervenes death usually occurs in three or four days.

(*c*) *Subacute Type.*—Here the onset is less acute and constipation may precede the onset of grave symptoms by several days (as many as 15 have been recorded). In other cases there is pain in the lower abdomen, indefinitely localized, with a moderate amount of fever. While one is hesitating over the possible explanation of the symptoms an acute development of the peritonitis may take place. Possibly some of these cases are explained by the final rupture of a small abscess into the peritoneal cavity.

(*d*) *The "Obstructive" Type.*—Lejars in particular has drawn attention to this puzzling type of case. He has reported cases in which, after a varying period of more or less obstinate constipation, the condition of the patient has become suddenly grave. The face becomes pinched, the tongue dry, the pulse is quickened, the abdomen exhibits meteoric distention and becomes resistant to palpation; yet there appears to be no special localization of

pain and the temperature is not raised.   In face of such a symptom-complex the diagnosis of intestinal obstruction is the only one possible and it is only by a laparotomy that the true nature of the case and the presence of a general peritonitis is revealed.

Every surgeon, from time to time, is called upon to operate upon cases of general peritonitis in which careful search fails to reveal the cause.   I think the majority of operating surgeons would admit that until comparatively recently such search has not included a special and systematic examination of the sigmoid loop.   In future this proceeding cannot be omitted by any careful operator.

3. **Intestinal Obstruction.**—This may be either acute or chronic. When acute it is usually due to involvement of the small intestine by adhesion, producing kinking or strangulation by band, as previously described.   When chronic it is almost invariably of the large bowel and then the *clinical mimicry of carcinoma is almost complete.*   This is one of the most striking clinical facts which emerge from the study of peridiverticulitis.   In such cases we have a patient fairly advanced in years, the subject of chronic intestinal obstruction low down in the large bowel, and frequently a very definite tumor is to be made out in the left iliac fossa.   The diagnosis of carcinoma is almost irresistible and in 25 cases in which stenosis of the bowel had occurred, in at least 12 the diagnosis of carcinoma was made, either before or at operation.   Moynihan has repeatedly drawn attention to the great liability to confusion between the two conditions.   The differential diagnosis between peridiverticulitis with obstruction and malignant disease must obviously be very difficult.   Very advanced age, comparatively recent constipation, marked cachexia and the presence of blood in the stools, all favor strongly the diagnosis of carcinoma; while long-standing constipation, the absence (after repeated examinations) of blood from the stools, together with any evidence of pus formation, would suggest the possibility of a peridiverticulitis.   But entire absence of constipation may occur with either condition, and blood has been found in the stools in at least one case of diverticular origin. After all, it is much more important that a correct diagnosis should be made at the time of operation rather than beforehand,

because in the vast majority of cases of either kind operation is indicated and should undoubtedly be performed. But once the abdomen is opened operative proceedings may require to be greatly modified according to the class of cases with which we have to deal. If a mass which involves the sigmoid loop and which is complicated by much adhesion is regarded as being certainly malignant its radical treatment would never be attempted. Doubtless in many instances a preliminary palliative operation would be indicated, just as for malignant growth, but the after-treatment in the shape of a possible second operation might easily be neglected if the simple nature of the case were not recognized at once. Attempting to remove an adherent mass which is of a simple inflammatory origin, is a very different matter to dealing with one which is liable to infiltrate the adherent viscera with malignant disease. Moreover, to perform a colotomy in a patient in whom a radical operation might have been successfully carried out, had the simple nature of the trouble been recognized, is obviously not the best surgery. Another practical point which should be borne in mind in such cases which are deemed to be favorable for radical operation by resection of the bowel, is that the separation of any adhesion that may exist is liable to open up one or many pockets of pus. This provides an added risk of septic infection of the peritoneum. There is no doubt that many cases have been operated upon and radical treatment successfully carried out, and as freedom from "recurrence" has naturally resulted, such cases have been proclaimed and recorded as "cures" of cancer. Such, at any rate, is the conviction of Bland-Sutton, Moynihan, and many other observers, the writer among the number; for one can scarcely resist this view when one has repeatedly found specimens of peridiverticulitis in museums incorrectly labelled carcinoma.

So far it has not been demonstrated that the use of the sig-moidoscope has thrown much light on differential diagnosis, yet there is reason to hope that its routine employment may be of some value. From what has been said previously as to the usual absence of ulceration of the mucous membrane in these cases, it follows that if ulceration or fungation is detected by the sigmoidoscope a diagnosis of carcinoma is almost certain. In the

24

majority of specimens of peridiverticulitis, however, diverticular
orifices are so concealed by the rugose mucosa as to render their
detection by the sigmoidoscope a matter of impossibility.   In
the presence, therefore, of clinical symptoms of intestinal ob-
struction very possibly the location of such a negative finding
would have no real weight.

4. **Vesicocolic Fistula.**—In this small but difficult and important
group of cases it is not too much to say that the whole outlook
has been altered by a study of sigmoid diverticula.   It is now
recognized, though perhaps not universally, that the majority of
these cases are not malignant in nature, and that where cancer is
not present the fistula owes its origin, with practical certainty, to
a peridiverticulitis of the sigmoid flexure.   As a result of a correct
appreciation of their true pathology a number of cases have
been successfully treated; Littlewood, of Leeds, in particular
has had several brilliant results in the last few years in cases
which had been regarded as hopeless from the surgical point of
view.

The first case of vesicocolic fistula of diverticular origin was
clearly described by Sydney Jones as early as 1858, but subsequent
writers failed to attach importance to these diverticula as a
cause of adhesion between the bladder and the large bowel.
Harrison Cripps in his monograph on "Passage of Air and Feces
through the Urethra" (1888) makes no comments on this cause,
though including Jones' case.   The view originally held was that
vesicosigmoid fistula was in most cases the result of malignant
disease.   In this connection it is useful once again to quote Sir
Berkeley Moynihan, who has drawn attention strongly to the
clinical importance and frequency of the diverticular origin of
vesicocolic fistula.   He says: "The formation of a vesicointes-
tinal fistula seems to be one of the tendencies of a perforated
false diverticulum; a search through the literature has shown that
it is far more common than was supposed.   In cases where a
hard growth in the intestine is accompanied by the passage of
flatus and feces by the urethra, a diagnosis of carcinoma seems
irresistible, yet the probability is that 'the growth' would be
simple, and that the cause of the fistula would be a false diver-
ticulum which had burrowed its way through all the coats of the
bowel, and thence through the wall of the bladder, which had

become adherent." When one studies the records of this class of cases one cannot help being impressed with the fact that many cases are almost certainly of diverticular origin, though such origin has been missed by the observer. The whole question was carefully investigated by Heine, in 1904, and he collected seven undoubted cases of diverticular origin and nine more in which such an origin was extremely probable.

Since that date a number of other cases have been observed and placed on record.

5. **Inflammatory Trouble in the Right Iliac Fossa.**—The recognition of this group, which is at present a very small one, is of practical importance to operating surgeons. As has been said, these acquired diverticula, though usually limited to the sigmoid flexure, may extend as high as the splenic flexure and sometimes occur throughout the colon. In not a few instances they have been found in the cecum, when the bowel for some distance immediately below this has been free from such diverticula. The cecum being a delay point for fecal material it is not surprising that diverticulitis, with perforation in addition, such as has been described in connection with the sigmoid loop, should occasionally occur in or near the cecum. A most interesting case of this kind has been recorded by Taylor and Lakin in which diverticula, very numerous in the sigmoid flexure, existed throughout the whole length of the colon, one of which had perforated $5\frac{1}{2}$ inches from the cecum. In another case under the care of the late Mr. W. H. Brown, of Leeds, a diverticulum of the cecum had perforated, giving rise to peritonitis, though the presence of the sigmoid lesion was not established in this case. Another case, as yet unpublished, which occurred in the practice of Mr. Mayo Robson, showed several inflamed diverticula, and the perforation of one of them with local suppurative peritonitis. The patient recovered and the question of the existence of a sigmoid lesion was not definitely cleared up. Probably in future cases of the kind more attention will be paid to the condition of the sigmoid flexure, which may possibly require surgical treatment at the same or a subsequent operation.

Such cases cannot be differentiated from ordinary appendicitis clinically. The only point of practical importance is that in operating on such cases the cecum should be carefully explored

if the surgeon is not satisfied that the condition of the appendix is adequate to explain the symptoms or the inflammatory trouble found locally. The possibility of some cases of general peritonitis arising from this cause in this situation must also be borne in mind.[1]

Treatment.—The early recognition of this very interesting but often overlooked surgical condition is most important. Particularly so in that, if allowed to progress, it frequently results in a vesicocolic fistula, and the danger of ascending infection from this complication is well known to us all. The bladder symptoms and their treatment often overshadow the original infection, so that by the time the patient comes under the observation of the surgeon he is much run down and not a good subject for operation.

Again, the sigmoid may be so involved in the inflammatory process that restoration of the continuity of the bowel is quite impossible. A local abscess may form, resulting in local peritonitis or perforating into a loop of the small intestine; if not quickly diagnosed this results either in obstruction or, the abscess perforating, general peritonitis ensues.

It will thus be seen that it is impossible to lay down an inexorable rule for every case of diverticulitis; the surgeon should be guided entirely by the conditions found at operation. In acute inflammation, with abscess formation, the proper treatment is drainage of the abscess, then resection of the affected bowel with end-to-end or lateral anastomosis, as may seem wise in the operator's judgment.

If intestinal obstruction is the patient's condition when he comes under the surgeon's observation, immediate relief is imperative. The procedure to be followed, however, will depend entirely on the location of the obstruction, the condition of the patient, and, above all, the comparative length of time the obstruction has existed. Should it be recognized within the first twenty-four hours, the abdomen should be opened, the obstruction located, the bowel brought out (with the abdominal cavity, carefully walled off with gauze pads), opened, washed out, after Moynihan's

[1] Reference to the two following articles by the author will give a fairly full bibliography on the subject: 1. Acquired Diverticula of the Sigmoid Flexure, Lancet, March 21 and 28, 1908. 2. The Clinical Aspects and Importance of Sigmoid Diverticula, Proctologist, March, 1911.

procedure, with subsequent end-to-end anastomosis. This would be apt to give the best result. In the case of a high infection, immediate relief of the obstruction is of first importance, because high obstructions are speedily fatal. Where the obstruction has existed for twenty-four hours or longer, owing to the adherence of a loop of ally the liver becomes surfeited with ptom, drainage, and the est accumulates in the liver and other organs of terostomy above the point of obstruction, would seem the safest procedure. In all cases, Murphy's dictum should be followed of "getting in quick, and getting out quicker." In the case of acute general peritonitis, due to rupture of the abscess, drainage of the ruptured bowel, in the hope of removing the source of infection, with drainage of the pelvis through the most accessible route, putting the patient in the Fowler position, followed by a continuous, Murphy drip, would be the logical procedure. When a communication exists between the colon and the bladder, or between the sigmoid and bladder, which is the more usual occurrence, provided there is no acute process, the procedure described in the chapter on vesicocolic fissures should be adopted. If the infection is more or less attenuated, we have the proliferated process. Usually, under such circumstances, a diagnosis of carcinoma is made, and it is only after the tumor has been removed and examined by the pathologist that the real diagnosis is made. Under these circumstances, the treatment would be similar to that followed in malignant tumors. If the diagnosis is made before operation, then the resection of the bowel, either by the three-step method of Tuttle, or by lateral, or end-to-end anastomosis, would be a very much simplier matter than if we were dealing with a malignant tumor, because of the fact that the bowel would be removed close to the mesentery and there would be no danger of sloughing from interference with the blood supply. We are aware that anatomists claim it is impossible to so interfere with the blood supply of the sigmoid or colon, that there would be secondary sloughing from lack of blood supply. Clinically, there seems to be greater danger in an end-to-end anastomosis than in a lateral. The writer has had excellent results from the end-to-end method, but surgeons of larger experience lay stress on this point and we cannot be too conservative when it comes to a question of the patient's survival.

CHAPTER XXI.
ι.—The early recognition of this very
overlooked surgical condition is most impo

Chromatosis (von Recklinghausen's Disease).—We will chronicle under the head of chromatosis pigmentations of the rectum and sigmoid, as observed by the writer. Under the title of Hemachromatosis, von Recklinghausen first described the various forms of pigmentation, both local and general, that occur in the intestinal tract. There are certain forms of hemachromatosis where the pigment is distributed in organs ohter than the intestinal tract; and it is sometimes associated with diabetes and cirrhosis of the liver. These we will briefly mention in passing, but will not go into a discussion of the details as they are not within the scope of a book of this kind.

The various pigments may be divided into endogenous and exogenous:

Endogenous $\begin{cases} \text{Hemachromatosis} \\ \text{Pseudomelanosis} \\ \text{Melanosis} \end{cases}$

Exogenous: Chemical and metallic pigmentation.

In order to have a clear understanding of this disease, it is necessary to have some conception of the origin of the different pigments formed in the body, and those that are taken up from the outside and undergo chemical changes within the body, causing a discoloration of the tissues.

Hemolysis is constantly taking place in the body. In other words, red-blood cells are constantly breaking down and new ones take their places. Hemoglobin is a compound protein containing globin and hematin. When the hemoglobin is freed from the corpuscle it divides into hematin and globin; the hematin further disintegrates into an iron-free pigment, hematoidin, and an iron-containing pigment, hemosiderin. There is also a brownish

pigment, described by von Recklinghausen, hemofuscin, the origin of which is uncertain. The iron is abstracted from the hemosiderin in the liver and goes to form new hemoglobin. The other constituent is converted into bilirubin.

When there is a greater destruction of red matter than takes place normally the liver becomes surfeited with pigment, and as a result it accumulates in the liver and other organs of the body.

Hemachromatosis.—Under the head of hemachromatosis von Recklinghausen describes all cases of both local and general hemachromatosis.

Opie believes that hemachromatosis is an entity and should be confined to the following important features: the presence of an iron-containing pigment in the epithelial cells of various glands, notably the liver and pancreas; the presence of an iron-free pigment in the smooth muscle cells of the gastro-intestinal tract, the blood- and lymph vessels and in certain connective-tissue cells; and, added to this, cirrhosis of the liver and pancreas, with or without diabetes.

Under the head of Bronzed Diabetes, Hanot and other French writers have described conditions somewhat resembling the hemachromatosis of von Recklinghausen. They were of the opinion that diabetes was primary and the hemachromatosis secondary to blood changes, the result of diabetes. It is now believed that this is not the case, and that the diabetes is an end-result of a general fibrosis of the pancreas. Dr. Abbot does not agree with Opie that general hemachromatosis is a specific disease. She believes that both general and local hemachromatosis are due to the same cause, which is probably bacterial. She further thinks that the hemofuscin of von Recklinghausen is also an iron pigment, and probably a derivative of hemosiderin, the only difference being that in the hemofuscin the iron is more firmly united and does not readily give the reaction with Perle's test. She claims that the pigment found in brown atrophy of the heart differs from hemofuscin in that it is an iron-free pigment.

Adami thinks that both local and general hemachromatosis are simply an indication of the destruction of red-blood corpuscles extending over a long period of time, with a subsequent heaping up of pigment, more particularly in the liver, and that the cells

of that organ are incapable of dealing adequately with the iron-containing portion of the hemoglobin, which thus remains in a fixed state in the liver cells and other cells throughout the organism.

All agree that both local and general hemachromatosis are the result of hemolysis from whatever cause. As to whether the hematin divides into its various pigments where it is found, or whether it is first taken up by the liver and spleen and there split up into the various pigments, has not been definitely settled. All seem to agree that iron-free pigment is seldom found in local hemachromatosis, and that both pigments are found in general hemachromatosis.

Local hemachromatosis may be the result of any one of the following conditions: (1) Inflammation; (2) any obstruction of the portal circulation, such as thrombosis. The immediate cause is hemorrhagic exudate; the remote cause, an inflammation the result of septic processes following thrombosis, or it may be due to nevi, dilatation of the varicose veins, abnormally large caliber of the bloodvessels, and increase in number of the bloodvessels; a chronic congestion with the resulting hemorrhagic exudate. An example of this is pigmentation around the varicose veins of the limbs.

Symptoms.—There are very few symptoms connected with this disease. It is nearly always associated with constipation, and most of the cases of general hemachromatosis have been preceded by some intestinal disturbance. The treatment should be directed to the intestinal tract, as we believe that this is the principal source of infection.

The author is inclined to think that hemachromatosis is of bacterial origin; that the extent of the disease is dependent upon the severity of the infection; that the probable source of infection is the intestinal tract, possibly starting as an intestinal putrefaction; that this intestinal putrefaction lowers the vitality of the tissues, and thereby the cells of the mucous membrane lose their protective properties, consequently bacteria find ready access to the portal circulation. As a result of this, the chromogenic function of the liver is interfered with, the liver becomes surfeited with pigment and is not capable of abstracting the

PLATE IV
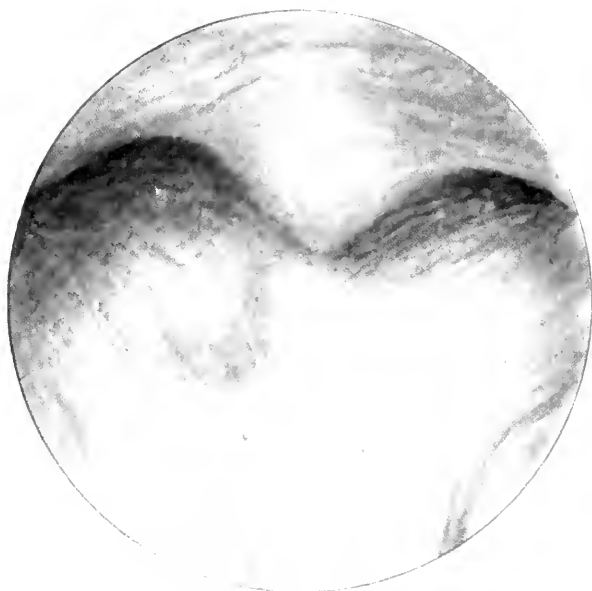
Pigmentation of the Rectum. (Lynch.)
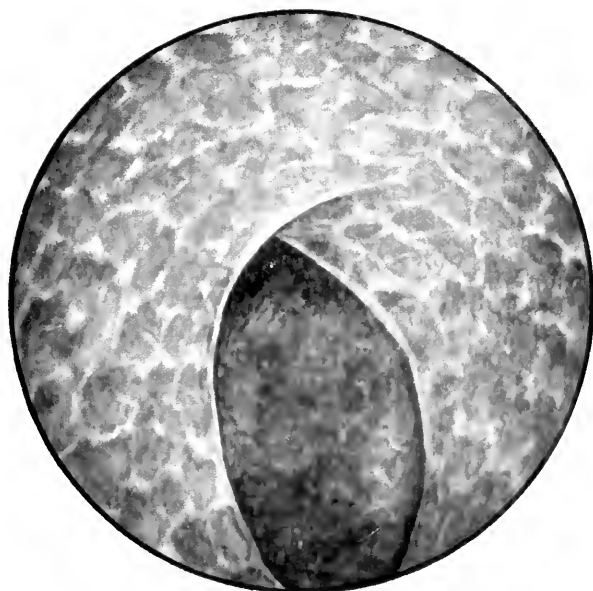
Pigmentation. (Lynch.)

iron from the hemoglobin, with the result that an excessive amount of pigment is circulating in the blood. Further, the cells of the intestine probably have a selective action for these pigments, and as a consequence they are deposited in the tissue. Local hemachromatosis may be due to repeated local hemorrhages, followed by infection; and as a result of this infection the bacteria cause a hemolysis, forming pigment which resembles hemosiderin, hematoidin and hemofuscin. These pigments may or may not give a reaction for iron.

Pseudomelanosis.—Pseudomelanosis is a black pigment which results from the action of sulphureted hydrogen on hemosiderin. We mention this to distinguish it from the true melanosis, which occurs as the result of activity of certain specialized cells which produce a black pigment occurring in such diseases as sarcoma, Addison's disease, and pigmented moles.

Ewan has found the blood pigment in malaria, where it is evidently an end product of proteid putrefaction.

Melanosis.—Melanotic pigmentation of the large bowel is a comparatively rare disease. Pick collected eighteen cases from the literature, but three of these cases are doubtful.

Melanins.—The melanins are a group of nitrogenous compounds closely related to the proteins. Little is known as to the origin of these pigments. We say these, because, while they seem to be apparently similar, there are some variations in their chemical composition. They are characterized by a high carbon and a low hydrogen content. Melanin occurs normally in certain parts of the body, such as the choroid coat of the eye, in the skin and hair. It is estimated that the skin and hair of the negro contain about 1 gram of pigment. It is produced in quantities in certain new growths and melanotic tumors. It is occasionally associated with pregnancy and Addison's disease.

It is extremely difficult to obtain a purified specimen of melanin, and from this we can see that it is correspondingly difficult to learn the exact chemical composition.

Humin Substances.—These black products are obtained by the hydrolysis of all the albuminous bodies with acids. Glucosamin, tryptophan, tyrosin and lysin can be precipitated as a black pigment.

Melanotic pigmentation is very characteristic; it is the pigmentation that is perhaps most observed through the proctoscope. It is peculiar, in that unlike other pigmentations it is limited entirely to the large intestine, beginning at the distal surface of the ileocecal valve and terminating at the anus. It is limited strictly to the mucous membrane, and, so far as can be seen in a review of the literature, the pigment has never been found beyond the muscularis mucosa. It differs also from other forms of pigmentation in that it occurs without any apparent change in the histological structure of the mucosa. It is not accompanied by ulceration or inflammation. It is more marked in the cecum and descending colon, and gradually fades toward the rectum. So far it has been most frequently observed at autopsies.

In spite of the intense pigmentation of the colon, the remainder of the intestinal tract and the other glands of the body are absolutely free from pigment. The pigment is limited to the connective-tissue stroma, the epithelial and lymph nodules being free. Solger describes the pigmentation as grayish brown, dark brown, reddish brown, or rusty red to yellow. In Pick's case the colon was almost uniformly grayish or brownish. He rarely found a yellow tinge, and he believes that the other color variations are due in a great measure to the variable density of the pigment. Not uncommonly it has a peculiar glistening sheen. The pigment cells have an average diameter of 13.5μ to 14.7μ, and are always mononuclear with a central or eccentric round or oval nucleus.

It has been shown that certain species of insects like the mealworm, and certain fish, like the cuttle-fish, possess an oxidizing ferment which is named tyrosinase. This name was adopted at a time when it was believed that this ferment was a specific for tyrosis. Subsequent investigations have proved this to be incorrect, and it is now known that this ferment is capable of changing other substances, such as phenols, into a dark amorphous pigment which has been named melanin. This same ferment has been found in a number of species of bacteria, in *B. fluorescens non-liquefaciens*, *B. phosphorescens*, *B. putrificus* and *actinomyces chromogens*.

Pick believes that this oxidizing enzyme is produced as follows: that the melanin of melanosis originates from the aromatic

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Pigmentation of Rectum and Sigmoid Associated
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albumin disintegration products of the contents of the large intestine (indol, scatol) under the influence of an oxidizing ferment resembling tyrosinase, produced by the connective-tissue cells of the mucosa. The capacity for the production of this ferment is apparently individual. Indol and scatol are transformed into true melanin in the connective-tissue cells by way of absorption in the mucosa.

"This interpretation renders intelligible the otherwise inexplicable limitation of the disease to the large intestine, on the one hand, and to the mucosa with its connective-tissue cells on the other."

Gessard believes that tyrosin is the chromogen whose oxidation gives rise to the pigmentation in melanotic tumors. It is a well-known fact that the proteolytic aërobic bacteria by their action on the amino acids form certain aromatic bodies, one of which is tyrosin. An alkaline medium is necessary for the growth of these bacteria, and as these conditions are usually ideal in the lower ileum, the cecum and portions of the ascending colon, it is natural to suppose that tyrosin would be formed more frequently in this region.

Treatment.—Where these cases are associated with constipation, the most rational treatment is to relieve that condition and put the patient on a non-nitrogenous diet. Irrigation with normal salt solution, or sea-water rendered isotonic or even hypertonic, is sometimes very effectual. Painting the sigmoid and rectum with tincture of iodine increases the sensitiveness of the lower bowel and in this way improves the constipation. It also causes an increased leukocytosis, and in this way offers a protection against infection.

Exogenous Pigmentation.—Those inorganic metallic poisons, such as lead, silver, mercury, etc., which, when introduced into the system are rendered inert and made insoluble in the gastrointestinal tract by combining with proteins or with sulphureted hydrogen, form insoluble sulphides. The blue line around the gums is an example of pigmentation following lead poisoning. The cases of exogenous pigmentation so far reported have been those caused by the continuous use of mercury.

Exogenous melanotic pigments should be easily distinguished

from the endogenous pseudomelanotic or melanotic by a careful history, and, if necessary, examination of a specimen of the mucosa for metallic poisons.

Pick practically doubts the existence of this form of pigmentation—at least he questions it—and is inclined to think that such cases are not examples of exogenous pigmentation but of true melanosis of the large bowel. After a careful perusal of the cases, as well as the arguments advanced by Pick, we incline to a belief in the diagnosis of exogenous pigmentation. For this reason we have placed it in a class by itself.

CHAPTER XXII.

INTUSSUSCEPTION.

INTUSSUSCEPTION of the sigmoid is a condition which is much more frequent than is commonly supposed and has an important relation to constipation, auto-intoxication, hemorrhoids, and mucous membranous colitis. By the sigmoid, I mean that portion of the intestine between the bifurcation of the common iliac artery and the third sacral vertebra; in other words, the iliac S of the French.

Etiology.—When the mesentery of this organ is abnormally long it may be congenital or acquired. As the sigmoid is the storehouse, or fecal retainer, we can readily see how a long mesentery will, if calls of nature are not promptly heeded, cause embarrassment to the sigmoid. Inflammation, infection, and ulceration are very apt to follow under pressure of hard fecal matter on the mucous membrane when it is allowed to accumulate for any length of time. In order to evacuate the bowels drastic cathartics are given, and, when these fail to give relief, enemas in abnormal quantities are resorted to; as a result, straining at stool occurs, bringing the abdominal muscles and diaphragm into play, which, owing to the pressure from above and the relaxed state of the organ, eventually brings on intussusception.

It is naturally trivial at first; but when once started the difficulty of expulsion and the demands on the abdominal muscles and diaphragm for extra force are increased. The mesentery may become elongated from constant dragging, due to displacement of the surrounding organs after childbirth, or from inflammation. Acute diarrheal conditions, due to constitutional disease or infection, following amebic dysentery, are etiological factors to be considered. Also growths like polypi, by causing straining and a frequent desire to evacuate the bowels, are contributory factors.

Pathology.—Byron Robinson tells us that in these conditions the submesosigmoidal tissues, vessels, and veins are elongated and attenuated. Interference with the circulation causes disturbed secretion and peristalsis. There is an increase in the number of goblet cells, infiltration with round cells, infection, ulceration; also a thickening of the mucosa and submucosa. When these conditions have existed for any length of time, very extensive ulceration of the sigmoid occurs, and sigmoiditis or perisigmoiditis is the result.

Symptoms.—A feeling of unfinished stool, following a movement of the bowels, aching pain in the sacrum, a passage of mucus or membrane, a dragging sensation in the left iliac region, with a feeling of heat across the lower portion of the abdomen and back, periodic attacks of hemorrhage from the bowels, colicky pains before the bowels move, pain on sitting or standing for any length of time, headache, vertigo, nausea, vomiting, frequent and painful urination, pain down the back of the legs. The symptoms vary with the degree of intussusception, length of time it has existed, and the involvement of other organs.

The *feeling of unfinished stool*, following a movement of the bowels, is the most constant and typical symptom, and when present should lead to digital and proctoscopic examination of the rectum. It is described as a feeling of something in the rectum that should come away. In a short time after the movement there is a desire to go to the toilet again, when very little is accomplished unless an enema is taken. Assuming the knee-chest posture will very often give relief.

Aching pain in the sacrum and pain down the back of the legs are other symptoms which are present in all cases, and are, no doubt, due to congestion, pulling on the mesentery, and pressure in the sacroplexus.

The *feeling of heat* in the iliopubic region and in the sacrum is not present in all cases; but when it manifests itself it causes a great deal of distress. This symptom is due to congestion, because patients, as a rule, feel relief after a hemorrhage from the bowels.

Passage of mucus or *membrane* depends considerably on the degree of intussusception; if this is marked, membrane is passed; if not, only mucus.

Periodic attacks of hemorrhage usually occur in cases in which the intussusception is severe, and in which either constipation or diarrhea is a marked feature. It is probably due to the intense congestion caused by the obstruction to the return circulation. It also occurs when ulceration exists, and I have seen ulceration of the entire circumference of the bowel in these cases.

Colicky pains, before the bowels move, are due to an effort on the part of nature to get rid of the accumulated gas and fecal matter and to the pulling of the intestine on its mesentery in an effort to straighten itself. Adhesions of the sigmoid, or some other neighboring organ, may also cause it.

Pain on sitting or standing only occurs in a small percentage of cases; this is due to pressure and congestion in the anal region.

Frequent and painful urination is no doubt a reflex symptom due to the sympathy existing between the urinary and rectal sphincters.

Treatment.—The treatment may be divided into palliative and operative.

Palliative Treatment.—Palliative treatment is indicated in those cases where, owing to age or some constitutional disease, operative treatment is contra-indicated. The general constitutional condition of the patient must always be considered and a suitable diet prescribed; the bowels should be moved every day with a mild laxative, and an enema of olive oil or saline solution employed to wash the lower bowel and prevent straining. When the condition is exaggerated, the patient should be instructed to move the bowels when lying either on the side or back, and a bed-pan used. If there is discomfort and pain after the movement, rest should be advised, with the hips slightly elevated for an hour or two. The patient can be taught how to replace the intestine by passing a No. 3 Wales bougie, to the end of which is attached an inflating bulb; when the bougie meets with any resistance, a little air is introduced, and in this manner the bowel is gradually replaced. After this 4 ounces of oil, or some medicated solution, is introduced through the bougie in position, and the patient directed to rest for an hour, with hips elevated.

Office Treatment.—Office treatment once or twice a week is indicated in most of these cases, for by this means we are able to

see if ulcerations exist, and, if so, to treat them locally; also, the act of passing the tube and the massage incident to the air pressure seems to have a decidedly beneficial effect. If this procedure is followed impaction never takes place. And as we cannot always depend on the patient to carry out the treatment intelligently at home, it is well to keep him under our supervision until we are satisfied that there is material improvement.

Operative Treatment.—The patient is prepared in the usual way as for any laparotomy. Beginning about two and a half inches above the pubes an incision some three inches long is made on the outer side of the left rectus muscle. The sigmoid is easily reached through this incision and brought into view. Three or four Pagenstecher sutures are now passed through the inverted transversalis fascia on one side, through the muscular wall of the intestine, and again through the inverted edge of the transversalis fascia on the other side. In this way the intestine is suspended from the fascia instead of from the peritoneum. (This point should be borne in mind, because if the sigmoid is suspended from the peritoneum instead of from the transversalis fascia it gradually relapses, with the result that a suspensory ligament is formed, and a return of the old condition is inevitable.) The fascia is then closed by means of interrupted sutures, and the skin with continuous plain catgut sutures. The patient should be confined to his bed for at least two weeks, and the bowels moved about the fourth or fifth day.

CASE I.—C. D., aged twenty-three years; occupation laborer. *Family History:* Father and mother both living and well. *Personal History:* Has always suffered from constipation. *Present Illness:* About two or three years ago he began to have pain before the bowels moved; the movements were never satisfactory, and he had a feeling as if there was something more to come away. He passed mucus and blood occasionally, and suffered from severe pain in his back and left iliac region, which was so severe at times as to prevent his working. He felt better when he rested a while, but was hardly ever free from backache. Appetite was poor, and he suffered from indigestion. He had lost about ten pounds in the last six months.

Examination showed a normal heart and lungs. The abdomen was flaccid; there was slight tenderness over the descending colon and sigmoid, and patient complained of occasional pain over splenic flexure. Digital examination revealed a protrusion into the rectum which felt like an os uteri, and was surrounded by a sulcus. Proctoscopic examination showed hypertrophic catarrh of rectum, some mucus and fecal matter; sigmoidal mucous membrane was congested, bled easily, and was covered by a mucus resembling the white of an egg.

Diagnosis.—Prolapse of sigmoid.

Case II.—E. F., aged twenty-four years; nurse. *Family History:* Mother had typhoid fever several years ago which was followed by colitis and constipation. Father died of pneumonia.

Personal History.—Several years ago patient had cellulitis of the right leg, diphtheria, mastoiditis, and typhoid fever. She had suffered occasionally from muscular rheumatism, and had had a pain in the rectum and left side since she was thirteen years old. Pain was worse when she was constipated.

Present Illness.—About two years ago she had a severe diarrhea which lasted four months; following this, she suffered from constipation up to the time she was operated upon for appendicitis; after this, her stools were fairly regular for a time. She suffered occasionally from diarrhea; had had two attacks the week before, and since then had been constipated. Had distress and eructations an hour and a half after eating. About once in one to two weeks she had periods of severe griping or twisting pains which lasted anywhere from twelve to fourteen hours, and were followed by the passage of large quantities of mucus and membrane. She never had a satisfactory movement of the bowels, but was relieved when she took an enema.

Diagnosis.—Extensive adhesions between omentum and cecum; the omentum was also adherent to the descending colon or sigmoid. Cystic ovary about the size of an egg adherent to the sigmoid, which was prolapsed. Mass could be felt through the anterior wall of the rectum.

Case III.—Mrs. C., aged thirty-two years; widow; appearance healthy.

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Family History.—Patient had menstruated at the age of fifteen, and had always been regular. She was thirty years old when she gave birth to a child, and at that time was badly lacerated. It was necessary to perform upon her a perineorrhaphy and trachelorrhaphy. She had always had trouble with her bowels; griping pains all her life; never, as long as she could remember, had she had a satisfactory movement; troubled with gas and cramps in the lower part of the abdomen and a feeling as though there was a lump in the rectum. Since her child was born all her trouble had increased, and she had a feeling of heat across the lower part of the abdomen and a dull aching pain in the back. When walking or going up stairs she had a pain in the left inguinal region. Had flashes of different colors before the eyes and a feeling as if the top of her head were being lifted off. There was soreness all over the abdomen. About two hours after eating she had acid eructations, sometimes very bitter. She suffered from nausea and vomited occasionally. There was a floating kidney on the right side, and a movable kidney on the left. Had about three movements daily.

Diagnosis.—Prolapse of the sigmoid.

CHAPTER XXIII.

CONSTIPATION.

Constipation is a condition due to retention in the bowel for an abnormally long time of waste products which are left over after digestion is complete. We are indebted to Cannon for his studies on intestinal motility. We know the length of time normally taken by the food to traverse the small intestine, the length of time it remains in the cecum, when it should reach the hepatic and splenic flexures; and when, under ordinary conditions, the feces should be evacuated. Hertz, by his use of the x-rays on human beings, has corroborated the studies of Cannon. The present writer by his experiments has also confirmed these findings, so that at the present time we are in a position to treat this condition much more scientifically and effectively than has heretofore been possible.

In order to treat constipation successfully it is essential to have a proper appreciation of the following:

1. The physiology of digestion.

2. The reflex symptoms induced by any pathological condition in the organs concerned in digestion; as, for example, ulcer of the stomach and hyperacidity.

3. The influence which pathological lesions in adjacent organs may have on digestion; for instance, the gall-bladder.

4. The indirect influence which distant organs supplied by the sympathetic nervous system may have on digestion: severe pain.

5. The mental attitude of the patient: worry.

6. Abdominal musculature: atrophy; separation; hernia.

7. Formation of the chest, an acute costal angle being indicative of enteroptosis, which is associated with constipation.

8. The condition of the cecum, whether it is movable, dilated, or angulated.

9. The condition of the appendix: angulation or chronic inflammation.

10. The mobility, or immobility of the kidneys.

11. The condition of the intestinal musculature.

12. Age of the patient, his surroundings and occupation.

13. The individuality of different sections of the lower bowel. It has been shown that constipation may be due to retention of feces in one section.

The Physiology of Digestion.—One need hardly say how necessary it is to have a proper appreciation of the normal physiology of digestion. About 7 per cent. of digestion takes place in the stomach, its principal function being that of a receptacle, grinding the food, and doling it out to the small intestine in the right amounts. We can see from this that motility is a most important function of the stomach. When this is impaired the food remains in the stomach and undergoes putrefactive changes there. This disturbance of motility causes a reflex disturbance in the intestines. When the acid gastric juice reaches the duodenum it actuates an inactive secretin, which is absorbed by the blood, thus causing the pancreas to secrete. The pancreatic juice contains enzymes for the digestion of carbohydrates, proteins, and fats. These enzymes, with the emulsifying influence of the bile, and the succus entericus of the intestine complete the digestive processes. The proteins become amino-acids. This has recently been confirmed by the recovery of these amino-acids from the blood.

The question of the digestion and the absorption of the fats is still in a very unsettled state. We know that the bile emulsifies ordinary fats, at least fats that melt at body temperature, but whether they are absorbed as an emulsion or as fatty acids and alcohol is yet to be decided.

We must not overlook the fact that the succus entericus plays a very important function in digestion, and it is reasonable to believe that a disturbance of this secretion must have a profound influence on digestion. It may be that this disturbance is, in a great many cases, responsible for those temporary, and sometimes permanent, irregularities of intestinal digestion.

We know from experience, at least from the experiments of physiologists, the influence which grief, worry, fear, and excitement have on digestion. It has been shown that grief and fear cause a diminished secretion of the succus entericus. We know that

severe pain can cause intestinal paralysis. All these conditions must be taken into account when a patient is being treated for constipation.

There are anti-enzymes which have the power of neutralizing enzymes; and this gives us an explanation of how digestion can take place in a hollow viscus without the viscus itself undergoing digestion. Certain parasites also possess this enzyme, as, for example, intestinal worms, nematodes, trematodes, cestodes, etc., which pass through the intestinal tract without being digested.

Fig. 133
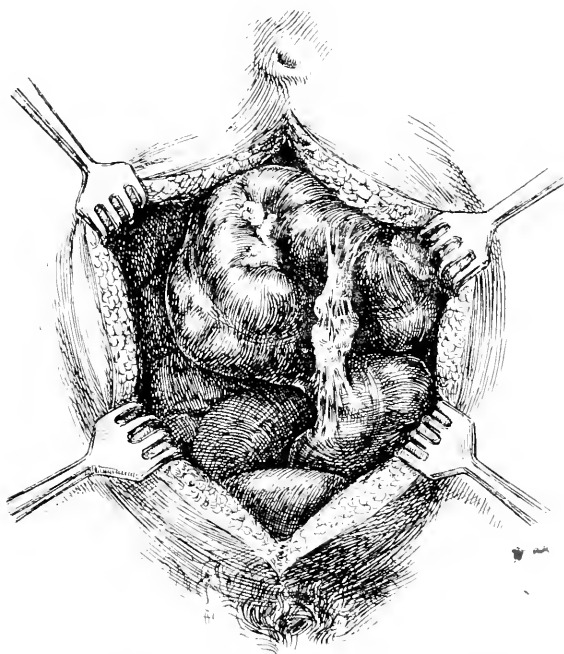
Acute flexure of the sigmoid, due to adhesions of two appendices epiploicæ, causing almost complete fecal obstruction. (Tuttle.)

Then there is the nervous control of the motility of the alimentary tract, which is under the control of the vagus and sympathetic nerves, and peristalsis is increased or diminished. For instance, tobacco causes paralysis of the inhibitory fibers of the sympathetic, increasing peristalsis; pain increases the inhibitory powers, diminishing peristalsis.

It has been estimated by some physiologists, that about 10 per cent. of the fats are absorbed in the cecum and ascending colon, the Lieberkuhn follicles taking the place of the villi. The other foodstuffs are supposed to be digested by the enzymes, which come down from the small bowel and continue their action. For this reason the cecum and colon are likened to the stomach. It is claimed that there is a reflex peristalsis or a to-and-fro movement in the cecum analogous to that in the stomach. As a result, this allows of the absorption of any remnants of digestion in this part of the bowel; but it has never been conclusively proved that this takes place. In our own experience with an iliac opening it was almost impossible to recover any enzymes from the opening. By the time the residue reaches the middle of the transverse colon all the water has been absorbed.

It has been estimated that the number of bacteria evacuated in the feces is about 128,000,000,000 every day. It has been shown by Suchsdorff that the variation in the number is influenced to a great extent by the kind of food and the quantity of food digested. The reaction has much to do with bacterial flora. We very seldom find the proteolytic and anaërobic bacteria in the small intestine. This is due to the fact that the reaction is always acid in this portion of the intestine, due to the organic acids which are formed during the digestion of food. On the other hand, the proteolytic and anaërobic bacteria find an excellent medium in the alkaline secretions of the cecum.

There are a few other facts which have an important bearing on constipation. So far as we are aware, no one has mentioned the fact that all of the water may be absorbed in the small bowel, and that this may be a cause of constipation; this was so in one case which came under our observation. We found by experimenting that we could, to a great extent, influence the acidity of the fecal matter by the quality and the quantity of the food. For instance, on an exclusively protein diet the chyme was always fluid when it reached the cecum; on a mixed diet, and especially where the carbohydrates predominated, the fecal matter was sometimes formed.

Finally comes the act of defecation, by which the residue is expelled after a certain quantity has accumulated. The act of defecation is partly voluntary and partly involuntary.

It can be seen from this very brief and incomplete résumé that there are many factors, any one of which may disarrange the continuity of digestion and excretion.

Fig. 134
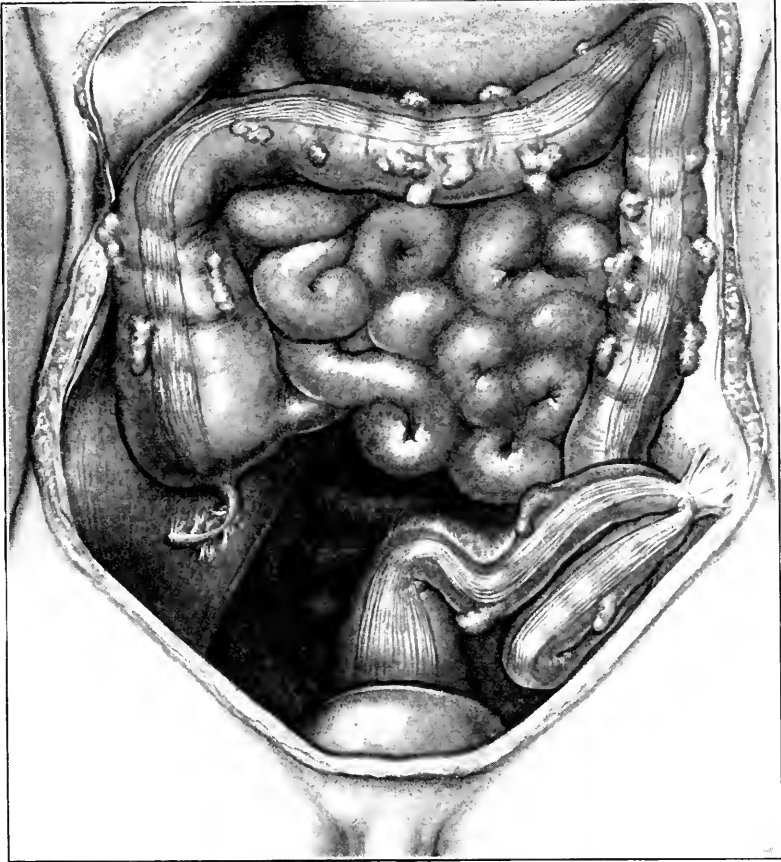
Acute flexure in the upper loop of the sigmoid due to adhesion of the gut just below the crest of the ilium on the left side. (Dr. Wyeth's case.) (Tuttle.)

Symptoms.—The symptoms of constipation are numerous and varied, and nearly every disease that man is heir to can be traced to the condition of his bowels. It is difficult to separate the symptoms and complications of constipation; they must be considered together. Of course auto-intoxication is not always

associated with constipation; but at the same time a constipated individual is more apt to suffer from auto-intoxication than one whose movements are regular.

Those working in institutions for the insane now recognize the importance of constipation as an etiological factor in insanity. Cases of neurasthenia, hypochondriasis and incipient insanity which have come under the care of the writer have been intensely benefited, and in some cases absolutely cured, when their constipation was relieved. Everyone who has practised medicine for any length of time has seen cases of headache, neuralgia, hysteria, and other mental indications of minor mental symptoms relieved, and in some cases cured, by proper attention to the hygiene of the bowel. The writer is convinced, after years of special work in this line, that more hypochondriacs and neurasthenics are created by the lack of a daily movement than by almost any other condition.

Vertigo is perhaps one of the most frequent symptoms of constipation. Of course the gastric symptoms so commonly associated with this condition may be due to the stomach, and constipation is secondary under such circumstances. As a matter of fact the functions of the gastro-intestinal tract are so interdependent and closely allied, embryologically, anatomically, physiologically, chemically and otherwise, that disturbance in one part or function will assuredly be followed by disturbances in other parts of the digestive tract.

The functioning of the stomach is to a great extent dependent upon the disposition of the individual. Pain and exhaustion will influence the secretion and mobility of the stomach and be duly reflected along the entire gastro-intestinal tract, resulting in disturbed functions and constipation.

The cells of the duodenum depend on the hydrochloric acid of the gastric juice to stimulate and actuate the pancreatic secretion. A disturbance of this function will seriously injure the health of the individual. Constipated people, as a general rule, have muddy complexions. Whether this is due to a mild jaundice or not we are not prepared to say. That jaundice may actually result from constipation is quite possible. This may be brought about in several ways: by an increase in the bacterial flora resulting

in catarrh of the duodenum and common duct, extending
to the cystic and hepatic ducts, followed by gall-stones and other
serious complications; or indirectly by hemolysis, which causes
the pigments to result in so-called hematogenous jaundice. Per-

Fig. 135
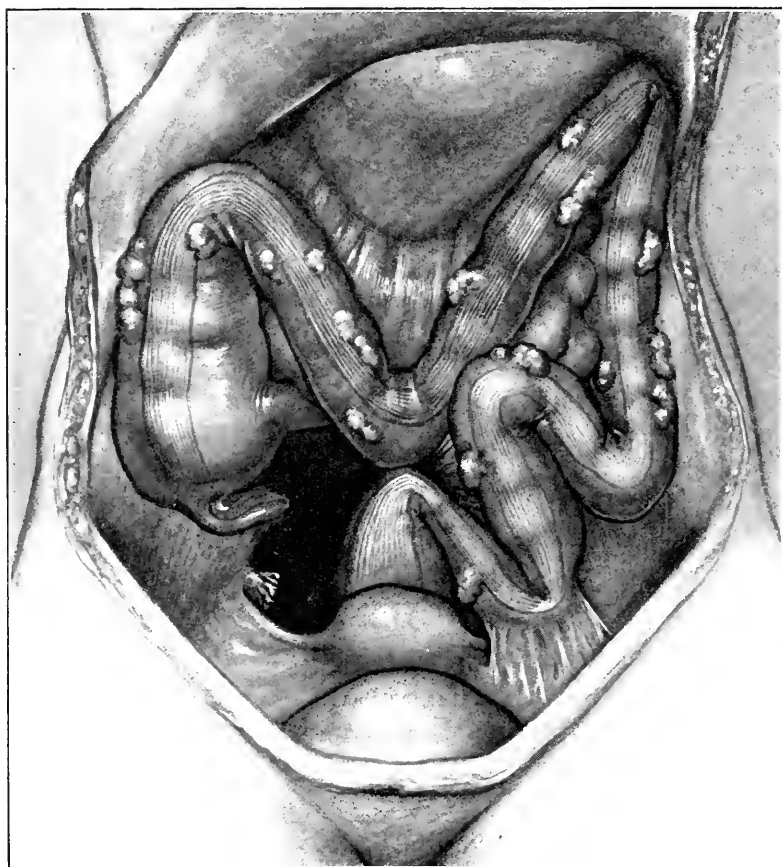
Gastro-enteroptosis with descent of the transverse colon, acute angulation of
the splenic flexure together with adhesion and angulation of the sigmoid flexure,
due to old tubal and ovarian inflammation. (Tuttle.)

nicious anemia is now looked upon as of intestinal origin, resulting
from constipation and auto-intoxication. The same applies to
dyspepsia, asthma, and other disorders of the respiratory tract.

Ebstein (in the *Deutsche Medizinische Wochenschrift*, Berlin,

October 19, 1911) suggests that while asthma is not always due to constipation, he has found these two ills so closely associated that he is inclined to believe that asthma is frequently a symptom of constipation. Further, he has found that when the constipation was cured the asthma subsided. This has been borne out in every case coming under the observation of the writer and his associates.

In one of Ebstein's cases there was an interval of nine years before the asthma returned, and this attack was accompanied by dyspepsia and constipation; but as soon as the gastro-intestinal functioning was restored the asthma again disappeared. He also describes a case in which a boy of eight, who was cured of an unusually severe attack of asthma, found that his constipation was also relieved.

Cardio-vascular disturbance is a frequent symptom of chronic constipation. Murmurs, palpitation with tension, and an irregular pulse disappear when constipation is relieved. Functional disorders of the kidney are occasionally symptoms of chronic constipation. Ovarian pain, bearing down feeling, increased micturition, congestion of the pampiniform plexus of the uterus, and disorders of menstruation are also occasional symptoms of constipation. The writer had one case under his observation for a number of years in which severe pain in the spermatic cord was the first symptom of constipation, and was always cured by relieving the latter. Gout was the first symptom in another case under our care.

It seems reasonable to suppose that there is a direct relationship between constipation and gout. As uric acid and other harmful products are converted into less harmful substances, if in the diseases such as gout and rheumatism uric acid exists in larger quantities than normally, we may infer that uric acid is not being converted into urea. As we know that this should take place in the liver, we must infer that some insufficiency of the liver exists under these circumstances. Furthermore, we know that constipation and auto-intoxication can cause temporary insufficiency of the liver, and we know that as the result of insufficiency of the liver an excess of uric acid occurs; therefore, if our premises are correct, we may say that constipation can precipitate an attack of gout.

Acne and other cutaneous eruptions frequently appear at the onset of an attack of constipation, and are nearly always present in chronically constipated individuals. That appendicitis can cause constipation, and *vice versa*, is admitted by all. It is therefore difficult to decide in many cases which is the cause, and which the effect.

Fig. 136
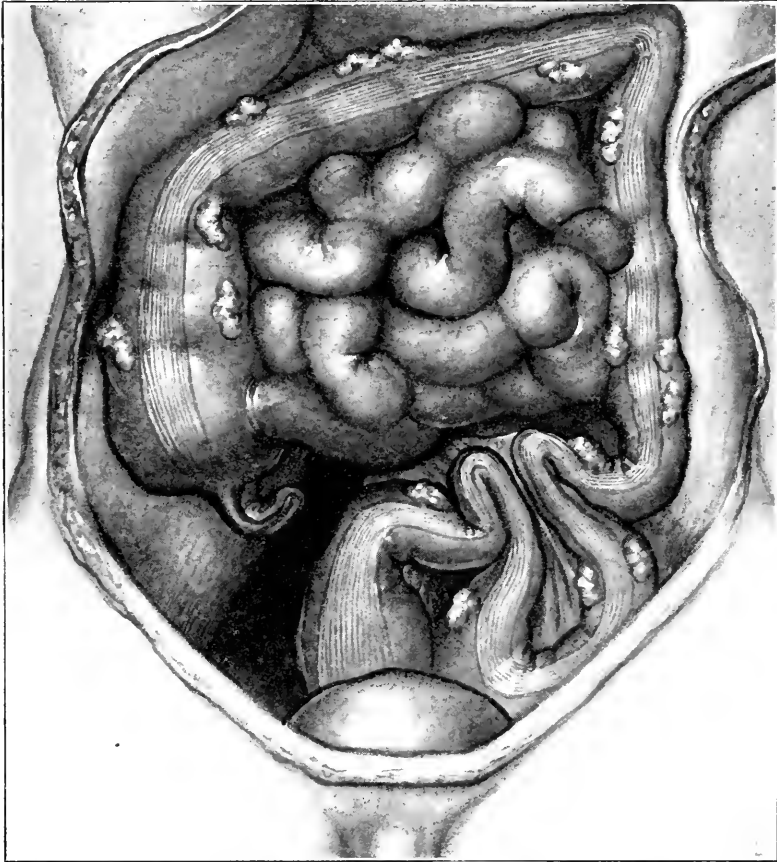
Acute flexure of the sigmoid due to too close apposition of its fixed points with the long mesentery to its intervening loop, this loop prolapsing into the pelvis. (Tuttle.)

Muscular weakness and enteroptosis are frequently associated with coprostasis, whether cause or effect it is difficult to decide; but they may be considered either as a symptom or as a compli-

cation. In two cases coming under our observation diarrhea was the only symptom which impelled the patient to seek relief. After the constipation had been relieved the diarrhea disappeared.

Cameron (*British Medical Journal*, October 14, 1911) reports the case of a domestic servant who suffered in an extreme degree from constipation for several years. Two years previous to the time he saw her she had suffered from epilepsy, the attacks occurring at an interval of about a fortnight. He performed an ileocolostomy, cured the constipation, and there was never a return of the epilepsy.

Diagnosis.—In order that the treatment of constipation may be carried out intelligently a searching physical examination should be made in every case. If this fails to demonstrate the cause, all modern methods should be tried, such as examining the stomach contents after a test diet, examination of the stools, proctoscopic examination, and the use of the x-ray. If the x-ray is not available a charcoal tracer may be used to demonstrate the time it takes for the food to pass through the gastro-intestinal tract.

Physical Examination.—A thorough physical examination should be a routine procedure, because without a thorough understanding of the patient's general condition it is impossible to make a diagnosis with any degree of certainty. It matters little what branch of medicine or surgery a man may be engaged in, there are certain routine measures which no physician should overlook; besides, both time and trouble are saved for the man who makes his examination thorough. Even though he may not be able to arrive at a definite conclusion, the physician may console himself that nothing has been omitted.

A general inspection will show at a glance such gross bodily defects as may have a direct bearing on the constipation. To the practised eye a general inspection of the patient will reveal a great deal: the color of the skin, characteristic of wasting diseases, malignant disease and jaundice, will direct the physician's attention to diseases of the gall-bladder, liver, and pancreas; pigmentation of the skin to internal secretions, especially to diseases of the suprarenal-capsule and hemachromatosis, so frequently associated with constipation, and so on. Defects of the mouth,

such as bad teeth, can be seen at a glance. Ptosis of the eyelid, which is an early symptom of locomotor ataxia, may at once give a clue to the cause of the constipation.

Fig. 137
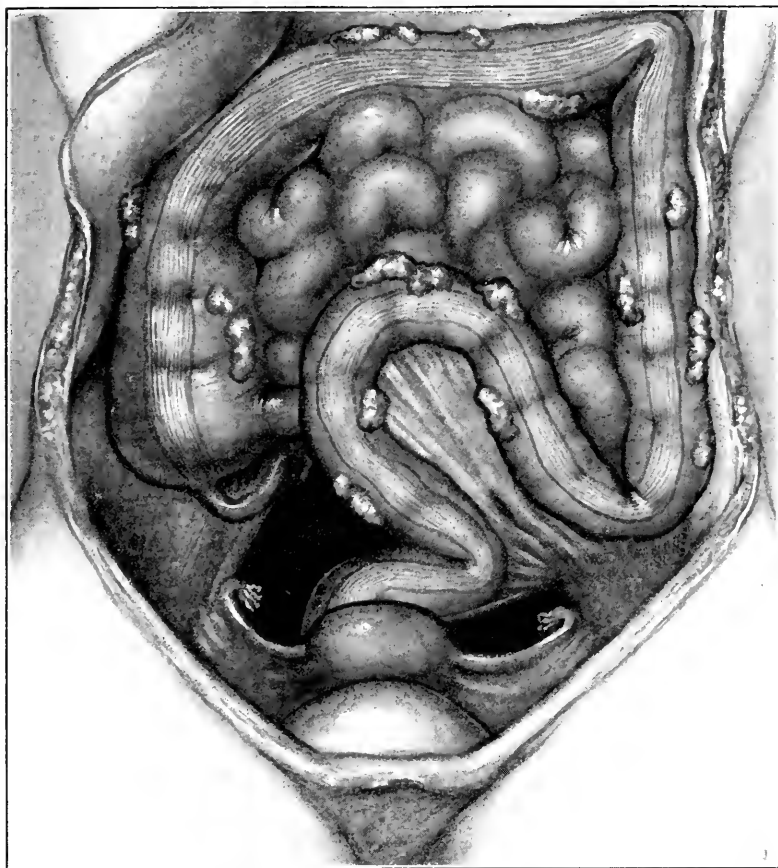
Acute flexure of the sigmoid, due to too close apposition of its fixed points with long mesentery to its intervening loop. The flexure at both its points is occasioned by accumulation of gas and lifting up of the long loop into the abdominal cavity. (Tuttle.)

Irregularities of the spinal column can be easily noted, and will be very helpful in elucidating the problem. A long narrow chest and concave abdomen are characteristic of enteroptosis. Observing the patient walk may direct the attention to a spinal

disease or an old cerebral hemorrhage. Again, the presence of varicose veins and a great many other bodily deformities may have a direct effect upon constipation, on account of compelling the patient to lead a sedentary life.

Abdominal hernias, separation of the recti muscles, pendulous abdomen, the presence of tumors, thickening of the cecum, tenderness over the sigmoid, splashing sounds in that organ, ptosis of the kidney, enlargement or ptosis of the liver, diseases of the gall-bladder, enlargement of the spleen, enlargement or displacement of the stomach, can with little difficulty be detected by the palpation and percussion of the abdomen.

Digital Examination.—Digital examination of the rectum should never be omitted, as it is the most useful method of diagnosis. It gives a good idea of the condition of the sphincter muscle, and an educated finger can detect immediately any deviation from the normal in the anal canal. The presence of ulceration, internal opening of a fistula, the condition of the levator-ani muscle, the presence of stricture or malignant tumor, hypertrophied valves, and intussusception of the sigmoid may be noted, any of which may cause constipation.

Proctoscopy.—A careful proctoscopic examination should next be made, as any pathological condition between the anus and the apex of the ascending limb of the sigmoid, even a little papilloma the size of the head of a pin, can be detected by means of the proctoscope. Further, when the proctoscope has been passed its full length, by putting the patient in a recumbent posture, with one hand on the abdomen and the other on the tube (which is moved from side to side) the mobility of the sigmoid may be determined. If, after all the examinations we have mentioned, a diagnosis cannot be made, proceed with the following method: The bowel, having been previously washed out with saline solution, the patient is given a prescription for 2 ounces of oxychloride of bismuth. He is instructed to suspend this in fermilac, or any other fermented milk, and to take the entire dose at eleven o'clock at night, and to return at nine o'clock the following morning. At this hour he is again given 2 ounces of the bismuth suspended as before; x-ray pictures are now taken at intervals of three hours. By this means the mobility of the stomach, of

the small and large intestine, any irregularities in the caliber of the bowel, displacements, angulations, etc., can be determined. If the bismuth reaches the cecum by nine o'clock the following morning we know mobility in the small intestine is not impaired;

Fig. 138
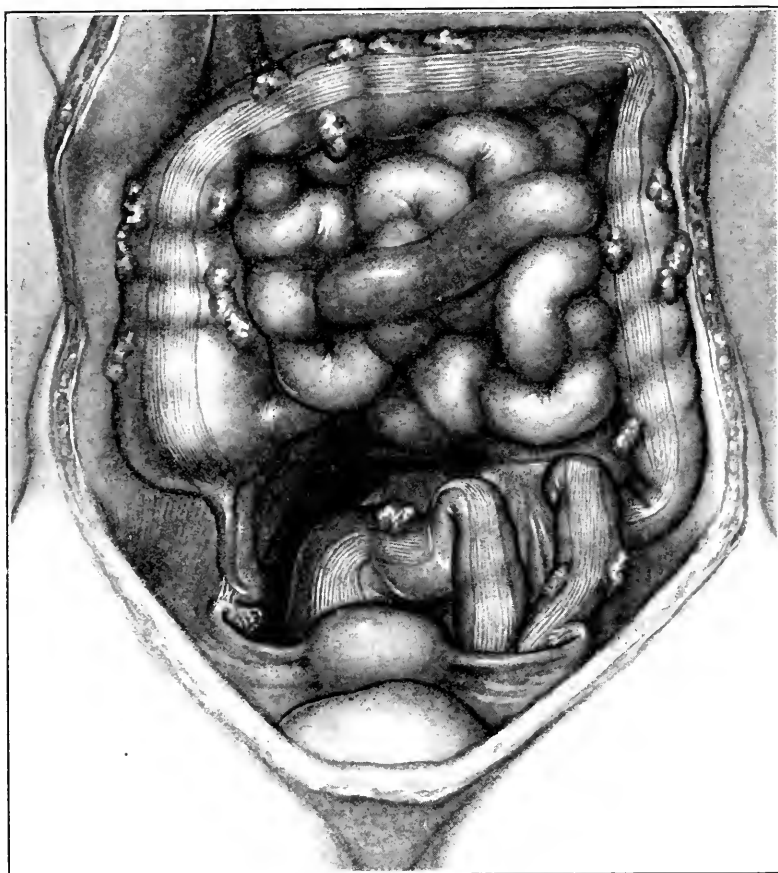
Acute flexure of the sigmoid due to too close apposition of its fixed points with long mesentery to its intervening loop. This loop, folding over itself, causes symptoms of volvulus. (Tuttle.)

if it reaches the hepatic flexure two hours later, we can rule out the cecum and ascending colon; if it reaches the splenic flexure two hours later on, we can rule out everything orad to this; and so by this method we can estimate with a degree of certainty

where the trouble lies. It is often necessary to continue taking radiographs for two or three days, and to inject through the rectum bismuth and air, in order to determine the relation of the sigmoid to the other organs. This is particularly so in radiographs which show the sigmoid apparently adherent to another organ. Whether these adhesions are apparent or real can be absolutely determined by injecting a little air through a catheter in the rectum. If after this we are still in doubt, or have eliminated the small intestine, and the shadow remains on the cecum a long time, by putting the patient on a Schmidt diet and afterward examining the feces we can get a fairly good idea of the digestion. Cases of constipation due to overdigestion can likewise be determined by this method; at least, it is a routine which should never be overlooked and is very often of material value as an aid to diagnosis.

Treatment.—No hard and fast rules can be laid down, nor is any special method of value in all cases of constipation. Every case must be treated as an entity, as no two human beings are alike. A method of treatment found useful in one case is of no avail in another. We must always bear in mind that the onset of constipation is insidious and gradual; that very often the patient has been constipated for years before seeking the aid of the physician; that often his life is governed by the movement of his bowels; that it may be very difficult to change the habits or surroundings of such an individual; that suggestion and personal magnetism are important factors, and are often more powerful than drugs in the treatment of certain cases. All things being equal, this accounts for the fact that one physician is successful where another fails. One should never be discouraged or lose hope of curing such cases until every known method has been exhausted. The writer has seen cases of constipation entirely due to nervousness and starvation, and when these patients were induced to live and eat regularly the constipation disappeared.

Prophylactic Treatment.—Prophylactic measures should begin with the education of the child. Habits, whether good or bad, are acquired in infancy, and are certain to influence the individual's future; this specially applies to constipation. Children should be instructed how and when to move their bowels. Regular

habits, regular and suitable meals, and a specified time to open the bowels should be a part of the education of every child. This is more especially true in the case of females, who from false modesty, pandering to their vanity, tight lacing, or perhaps

Fig. 139
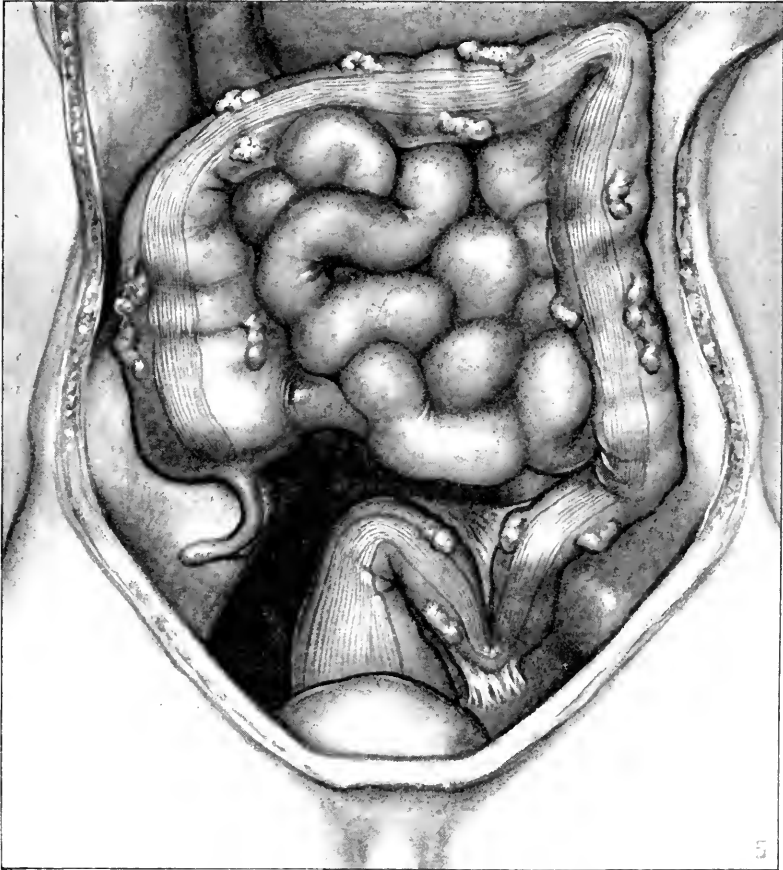
Acute flexure of the sigmoid, with adhesions to the tube and ovary. (Tuttle.)

lack of suitable surroundings, are apt to neglect the call of nature. Then, again, females lead a more sedentary life, and are more emotional than males. Lack of suitable surroundings, inaccessibility of a toilet, are very often responsible, not only in the case of children but in grown up people for constipation. Lack

of knowledge by those responsible for the construction of houses, and especially toilets, must be held in a measure as another cause of this evil. Badly constructed toilets, with seats too high or in other ways uncomfortable, prevent many individuals from having a satisfactory movement. As the abdominal muscles are in a great measure responsible for the defecation, the toilet should be so arranged that the knees are slightly flexed on the abdomen, which will enable the patient to supplement the pressure of the abdominal muscles and add materially to his comfort. There is one pernicious habit which should be eliminated from our school system, namely, that children are not allowed to go to the toilet when they beg to be excused. Children are often kept in by way of punishment, and the call urgent at the time passes away. The child may then go until the next day with no movement of the bowels. Such a condition should not be tolerated in this enlightened age. We are frequently questioned by patients as to the influence of tobacco on constipation. If there is no contra-indication because of some heart, lung, or kidney lesion, moderate smoking is rather helpful and at times has a very beneficial influence on constipated individuals, as it paralyzes the inhibitory fibers of the sympathetic system, increasing peristalsis.

It should always be remembered that while a moderate amount of smoking is beneficial, excessive smoking very often causes constipation. The reason of this is apparent from what has already been said, and we can readily understand how an excessive amount of nicotine, by acting on the inhibitory fibers of the sympathetic and allowing the motor fibers free play, results in severe spasm and constipation. A concrete example came under the observation of the writer not long since. By prohibiting tobacco all symptoms disappeared, but six months subsequently, when the patient again attempted to smoke, he had a severe recurrence of his spastic constipation.

Russian Mineral Oil, or English paraffin, was first suggested by Sir W. Arbuthnot Lane, of London, in the treatment of constipation. Its use since then has become almost universal. Like a great many other drugs, if used with judgment and in selected cases it gives excellent results, but when used indiscriminately and prescribed

by druggists, as it now is, it must do harm as well as good. It is an excellent drug in cases of constipation not associated with auto-intoxication. After a rather long experience with this drug, I would divide all people into four classes: (1) Those who have

Fig. 140
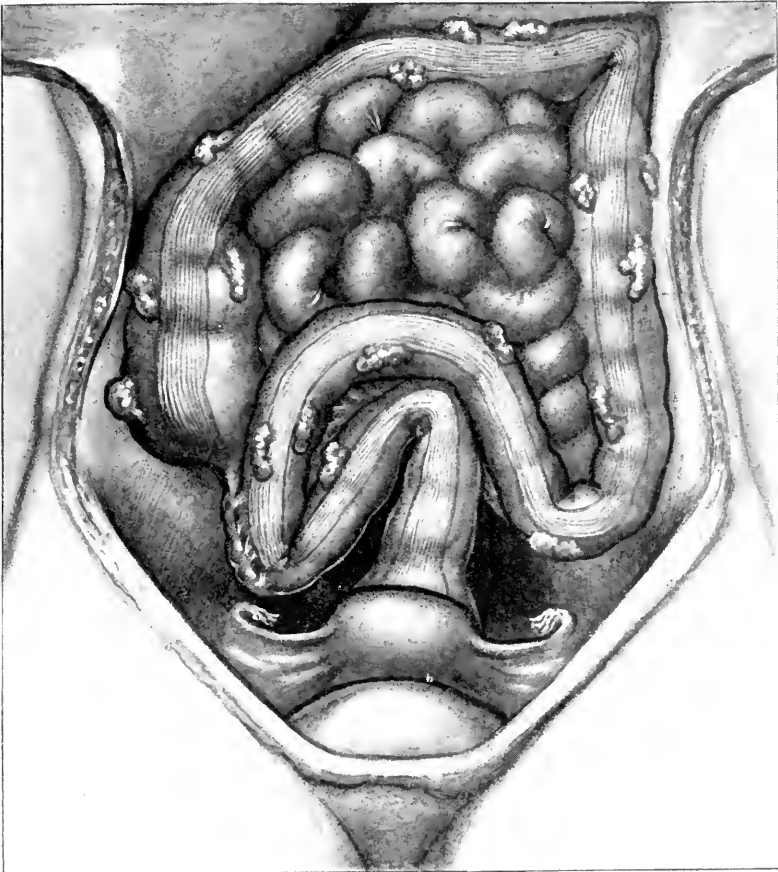
Acute flexure of the sigmoid upon the right side, with chronic appendicitis and adhesion. Short mesentery. (Tuttle.)

one or two movements daily and are very much benefited by the administration of this drug. (2) Those on whom it has no influence (so far as constipation is concerned), and who are constantly leaking oil every time they pass gas; not those whom

the oil runs right through without apparently doing any good. (3) Those who are apparently benefited for a short time, but who sooner or later have to abandon its use because it upsets their digestive apparatus. (4) Those cases where auto-intoxication is markedly increased. The stools become more fetid, and the oil does more harm than good.

We should always be on the lookout for the fourth class, and discontinue the oil when the manifestation which we have spoken of first appears. The explanation of why a mineral oil increases auto-intoxication is obvious, if we remember that procteolytic bacteria thrive best in the absence of oxygen, or, in other words, they are anaërobic. Now we believe that oil makes it possible for this condition to exist in the large bowel, where the anaërobic bacteria are nearly always found.

For the reasons we have mentioned, mineral oil should be prescribed only by a physician, and he should carefully watch so that if the patient to whom it has been administered does not come under the first class it can be discontinued.

Treatment by Drugs.—There are perhaps half a dozen drugs which, if used judiciously and with a knowledge of their therapeutic effect, are of undoubted value when indicated. Calomel, or the mild chloride of mercury, is perhaps one of the most frequently used and abused drugs in the Pharmacopeia. When indicated, as in so-called biliousness, fevers, or other conditions following an operation, to evacuate and partially sterilize the bowel, it is very beneficial and one of the best antiseptics known. It does not act on the liver, as was formerly supposed. If used frequently or continuously it is apt to cause mercurial poisoning and congestion of the mucous membrane of the bowel. Calomel is apt to cause a good deal of tenesmus and bearing down, and some people are very susceptible to this drug; it should therefore be used with a certain amount of caution. Nux vomica and its alkaloid, strychnine, are excellent drugs, especially in cases of atonic constipation. Strychnine acts by stimulating the peripheral nerve centres in the muscular cells of the bowel. It is suspected, however, of having some inhibitory influence on the pancreatic secretion. It increases arterial pressure, and should not be given for too long a period, especially to a nervous person.

Opium and its derivatives, when used with due caution, are exceedingly valuable, especially in spastic constipation. From $\frac{1}{8}$ to $\frac{1}{2}$ grain of codeine will very often relieve the most intractable case of spastic constipation. Belladonna with its derivatives,

Fig. 141
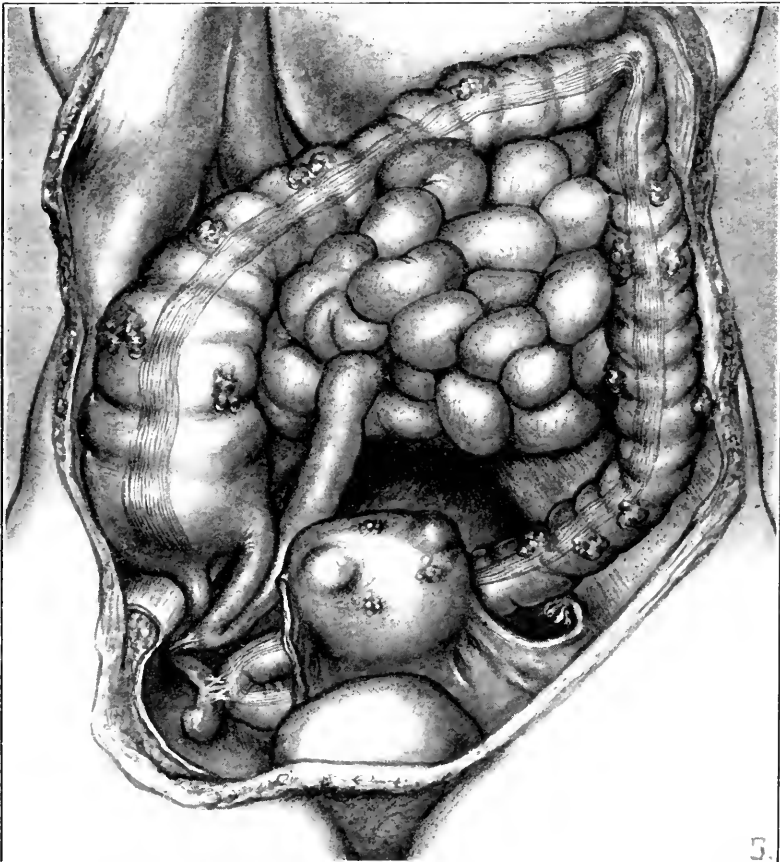
Acute flexure of the sigmoid, also of the ileum. Chronic appendicitis and multiple fibroids of the uterus. (Tuttle.)

by diminishing the excitability of the peripheral nerves and inhibiting excessive peristalsis, is a most useful drug in spastic constipation, especially when combined with opium. Hertz has shown by means of the *x*-rays that vegetable purgatives increase

peristalsis, both in the small and large intestine. This is brought about by irritating the mucous membrane of the bowel, and this acts reflexly on Auerbach's plexus. Senna, aloes, cascara and rhubarb all increase peristalsis, both in the small and large intestine; this is the result of irritation of the mucous membrane.

Saline Carthartics.—MacCallum and Hertz have shown that the ideas previously held as to the action of saline cathartics are erroneous. MacCallum was the first to show that the salines are absorbed from the small intestine, taken up by the blood, and through it act on the intramuscular nerve plexuses. These experiments of MacCallum also prove that salines act as rapidly when injected hypodermically or given intravenously; however, they act more energetically when painted on the peritoneum. The best results are obtained when salines are administered half an hour to an hour before breakfast and thoroughly diluted. The reason for this is apparent, as we all know that an isotonic solution if given on an empty stomach is retained in that organ a very short time. When given with food, or when the stomach is full, it remains in the stomach until all the food has been passed on into the duodenum.

PARTICULAR FORMS OF CONSTIPATION.

Spastic Constipation.—The diagnosis of this form of constipation is made from a history of frequent spasm, severe pain, and the formation of a tumor. It is frequently, but not always, associated with enteroptosis. Palpation of the colon very often precipitates an attack, and in the majority of cases there are certain points of tenderness which can be made out by this method. The treatment consists in placing the patient under the best hygienic surroundings and improving the general nutrition and tone of the body. When due to some reflex disturbance, such as ptosis of the kidney, this should be corrected. Lavage of the bowel by means of warm enemas, at body temperature and at low pressure, with or without medication, is effectual. Should a medicated solution be used, a 2 per cent. solution of ichthyol in warm water has given gratifying results in the writer's

experience. In some cases olive oil, heated to body temperature, is very beneficial. In others, especially those associated with enteroptosis, rest in bed, a highly nutritious diet, eliminating all coarse vegetables and foods that leave a large residue, with belladonna and codeine when the spasms are severe, will often effect a cure in this form of constipation. Hot fomentations, applied in the following manner, will frequently tide the patient over a severe attack: Two or three pieces of flannel, a couple of yards long, are folded twice, wrung out of very hot water, and applied directly to the abdomen; a piece of the flannel always remaining in the hot water so that they can be interchanged rapidly. After five or six minutes of this form of treatment the spasm will subside. Following this, the abdomen should be covered with warm flannel and the patient allowed to rest for several hours.

Postoperative Intestinal Spasm.—This form of constipation following abdominal operations is very distressing, both to the physician and the patient, and sometimes so closely resembles intestinal obstruction that the diagnosis is only made after a secondary operation. Morone reports a case in which convalescence after gastrectomy for carcinoma of the pylorus was disturbed by the spasm of the bowel coming on a day and a half after operation. The patient was a woman, aged fifty-seven years, and the enterospasm proved fatal twenty-eight days after the gastrectomy. The abdomen was opened again on the twentieth day, and the bowel was found in a condition of diffuse spastic contraction throughout its entire length. No benefit was derived from the laparotomy, and there were no signs of peritonitis at the autopsy, ten days later. Food injected into the rectum was vomited.

Constipation Associated with Gonorrhea.—The writer has noticed that this disease usually results in constipation, especially in the early stage. It is very often due to the spasm of the cut-off muscle causing a spasm of the sphincter; and in the majority of cases it is in reality a form of spastic constipation. There are cases, however, when it is entirely due to a derangement of the digestion resulting from drugs administered for the cure of the trouble. In other cases it is due to the fact that the patient

dreads going to the toilet on account of the pain associated with urination. This form of constipation, of course, is only temporary, and disappears when the urinary symptoms moderate. It is best treated by giving the patient some mild cathartic, such as castor oil or cascara, which produces a soft movement accompanied with very little straining. Sometimes it is necessary to supplement this treatment with low injections of warm water in order to relieve the spasm.

Constipation Associated with Overexertion and Excessive Exercise.—This form of constipation is seen in individuals who live a more or less sedentary life, and then occasionally take violent exercise. It frequently occurs in patients when they first move from the city to the country. It is due to the lack of carbonic acid in the blood. Of course, it is sometimes due to change of habits, food and water, and passes off after the patient has accommodated himself to his new surroundings.

Constipation Due to Overeating.—This form of constipation may be due to several causes, such as an excessive amount of fecal matter requiring extraordinary muscular power for its expulsion. As muscular power is lacking in these individuals, owing to the accumulation of fat around the bowel and the fatty infiltration of its musculature, this form of constipation requires rigorous treatment. The patient must be instructed to eat in moderation and to avoid those vegetables containing large amounts of cellulose, and in fact any food which leaves a large residue. Such patients should always be instructed to exercise. The kind of exercise depends in a way on the patient's income. If he can afford it, riding in the saddle, gymnastic work, and such exercises may tend to decrease the fat in the abdominal wall and improve the tone of the muscles concerned in defecation. Walking may be advised; tennis and golf are excellent. Abdominal massage is good for those who cannot afford a regular masseur. Massage of the intestines can be performed by the patient himself, by rolling a cannon-ball weighing five pounds and covered with chamois, over the colon every morning or at night. Vibratone massage can also be applied by the patient himself or some member of his family. There are several of these machines now on the market, and they can be had at a very reasonable price.

The vibration should be applied up and down the spinal column and over the course of the colon. It may be necessary to supplement those methods with drugs or enemas occasionally. Passing the proctoscope, massaging with air, or putting in a small amount of fluid, of ichthyol and glycerin, about a 2 per cent. solution, especially where sensation is lacking in the lower bowel, is sometimes very beneficial. Painting the lower bowel with pure tincture of iodine is often very effectual. When a patient is very much run down and suffers from enteroptosis, rest in bed, when possible, together with forced feeding, tonics, gentle massage, and placing him under the best hygienic surroundings, will prove of immense benefit. In fact, some cases of constipation can be cured by these measures only.

The following foods are very useful in this form of constipation: raspberries, currants, plums, greengages, cherries, peaches, pears, gooseberries, apples, strawberries, oranges, melons, beets, asparagus, onions, parsnips, turnips, carrots, cauliflower, rhubarb, mushrooms, cabbage, tomatoes, spinach, celery, watercress and cucumbers, whole meal bread and oatmeal bran. All the fats that melt at body temperature, if not contra-indicated by obesity in the patient, are useful on account of the stimulation caused by the excessive fatty acids formed. Among these may be mentioned cream, fresh butter, olive oil, and petrolatum.

Operative Treatment.—There are certain cases that can only be relieved by surgical measures. We will enumerate them.

Enteroptosis.—We are all aware that in the majority of cases of enteroptosis more relief can be obtained by medical than by any surgical procedure. It is now established that when these patients are put to bed on the Weir Mitchell treatment, and overfeeding and other Mitchell measures instituted, they are nearly always relieved of their constipation and stomach troubles. There are certain cases, however, where the angulations are so acute as to demand surgical measures for their release, especially where the ascending and one leg of the transverse colon are parallel; where the same condition applies in the descending colon; where the sigmoid is so buried by the small intestines occupying the pelvis that it is impossible for it to rise. Such a case is immensely benefited by some operation which will hold it up out of the pelvis.

Nephroptosis.—Nephropexy will give the greatest relief. In one case that came under the observation of the author the liver was down in the pelvis, and hepatopexy cured the patient of all the symptoms.

Again, there are those cases of constipation due to adhesions, stricture, malignant growths, chronic appendicitis, kinking of the bowel, chronic disease of the gall-bladder, ulcer of the stomach, stenosis of the pylorus, stone in the bladder, rectocele, diverticulitis, spasm of the sphincter, laceration of the perineum, etc. All these conditions demand surgical measures before we can cure the constipation.

Mobility of the Cecum.—A cause of constipation that has only recently been studied, particularly by Wilms, is mobility of the cecum with or without adhesions. The question has not been definitely settled whether these adhesions are due to a late descent of the cecum and a reduplication of the peritoneum, or whether they are due to a perityphlitis as a result of stasis. Professor Stockard, of Cornell, is inclined to think that they are due to a perityphlitis.

It is still more difficult to decide whether they are the cause or the result of constipation. It seems to the writer that a movable cecum very probably results in constipation by causing spasm of the bowel. The writer has had three cases of intestinal obstruction in constipated patients due to a *volvulus of the cecum*. In one case the mesentery of the entire colon was unusually long. It appears that this condition exists in about 5 per cent. of subjects.

Wilms, from his experience, has come to the conclusion that there is always a stasis in these cases and he has been able to demonstrate this by means of Röntgen pictures, and says "that as a result of this stasis the water is absorbed, consequently the fecal matter becomes thick and the rest of the colon is forced to exert greater power to push the thickened contents on." As a result of this stasis an antiperistaltic action takes place in the colon, together with a spastic condition due to irritation, this causing the attacks of pain.

Dr. Klose,[1] of Frankfort-on-the-Main, discussing Wilms' paper,

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[1] Annals of Surgery, January, 1912.

read before the German Surgical Society, Fortieth Congress, April 19 and 22, 1911, said that, since 1904, the Frankfort Surgical Clinic has recognized the existence of cecum mobile, as described by Wilms. During this time 154 cases have been operated on, with a complete cure in 89 per cent.

Dr. Goebell, of Kiel, has had excellent results in cases of obstinate constipation after fixing the cecum.

It would seem rational to suppose that a movable cecum, on account of the pain and spasm, would result in constipation. Besides, this condition so often causes chronic appendicitis and hyperacidity of the stomach that it must be considered an etiological factor in chronic constipation.

Treatment.—The treatment of constipation due to mobile cecum can very seldom be relieved by anything short of surgical procedure. If the appendix has not already been removed, an appendicostomy is the most rational method, because by this means the cecum is fixed and at the same time the bowel can be irrigated, and whenever found necessary the appendicostomy opening can be closed by destroying the mucous membrane of the appendix. The writer has found that this procedure gives excellent results, and if the appendix has been removed a Gibson cecostomy should be performed. Of course a cecostomy is more difficult to close than an appendicostomy opening, but the results are so satisfactory that the operation is justified.

As mentioned in the beginning of this chapter, in some individuals the water is absorbed so rapidly from the small intestine that the fecal matter is practically formed when it reaches the cecum. In one case where we had occasion to make an opening near the ileocecal valve in a patient who had suffered all his life from chronic constipation (and subsequently developed an intestinal obstruction as a result of a volvulus of the cecum), the discharges were soft and mushy, but never fluid.

Lane's Veil.—Lane, in a paper on Chronic Constipation (published in February, 1908), described what he called the *cobweb adhesion* around the cecum and colon. These adhesions, he believed, were due to stasis, followed by ulceration in the colon, with a subsequent colitis and pericolitis. It remained for Jackson (in December of the same year) to describe this

pathological condition. This condition is now known as the veiled colon of Jackson. The author has seen a number of cases within the last four or five years, the membrane showing a structure of serous nature.

The veil, which Sir W. A. Lane was the first to describe, is a peritoneal embryonal reduplication which has subsequently undergone simple inflammation. There is a body structure composed of very dense fibrous tissue which is, for the most part, very vascular. The vessels vary in size from capillaries to vessels of macroscopic dimensions. They all have well-formed walls which show more or less a cloudy swelling, and some of the larger ones show a slight sclerosis. They are universally congested. Here and there throughout the fibrous tissue stroma are small foci of inflammation, in which there is an exudate composed of leukocytes and serum. Throughout the stroma tissue are numerous spaces which appear to be lymph spaces. The surface of the veil is covered by endothelial cells which show cloudy swelling and extensive desquamation.

The membrane has the appearance of an altered peritoneal coat which has been changed by an inflammatory process to a more or less vascular fibrous tissue covered by endothelium identical with that found on the general peritoneal surface. Such structures probably have an embryonal origin, and are formed by the reduplication of the peritoneum by the colon as it descends into its normal position in the right iliac fossa. The free margin of these folds usually becomes attached to the parietal peritoneum, which may be over the surface of the colon. They are prone to inflammation from attacks of colitis or chronic constipation, and as a result develop a dense fibrous tissue stroma and an increase in the number of vessels.

Sections through the lymph node show a capsule of normal thickness, infiltrated in places by an exudate of polynuclear leukocytes and serum. The enlargement of the node is due to hyperplasia of the lymphoid cells of the follicles at the periphery of the gland, and to a very marked dilation of the lymph sinuses throughout the medullary portion. In addition to these changes there is a general congestion of the bloodvessels and an exudate of serum and leukocytes. The walls of the bloodvessels show cloudy

swelling. The entire change appears to be a simple inflammatory hyperplasia. There is no indication of tuberculosis, syphilis, or new growth.

Diagnosis.—Simple inflammation of embryonal peritoneum; reduplication situated over cecum with simple inflammatory hyperplastic lymphadenitis.

Why a congenital deformity like this should have such a profound effect on the functioning of the colon it is difficult to say. The fact remains, however, that these cases are immensely benefited and the constipation relieved when this upper layer, together with the bloodvessels, is tied off. There are certain cases of chronic constipation with auto-intoxication and an associated fibrosis of the colon. These cases suffer from the most obstinate constipation, and in the opinion of the writer demand some form of surgical treatment. On this point nearly all physicians agree.

Sir W. A. Lane has suggested an ileosigmoidostomy, and if this method is not successful, the subsequent removal of the entire colon. It must be admitted that these cases are desperate and require radical measures for their relief, but it is difficult to say that such a radical operation as removal of the entire colon is justifiable. Except in cases of malignant tumor it would seem that an appendicostomy or a cecostomy would accomplish all that Sir W. A. Lane does with his more radical operation, and these operations have no mortality other than that from the anesthetic. The writer has performed ileosigmoidostomy in two cases, and the after-results are far from ideal. One patient, operated on about three years ago at Miss Alston's Hospital, was one of the most desperate cases of constipation that ever came under his observation. The entire colon was a fibrous tube wrapped in a mass of adhesions, and was such a case as described by Sir W. A. Lane as entirely suited for an ileosigmoidostomy. Since the operation the patient has suffered from inveterate diarrhea, and it has taxed the experience and ingenuity of the writer to control it. A second case, somewhat similar to the first but not so pronounced or so badly situated, resulted exactly like the first. With these two experiences, we are not likely to repeat the operation. In the first case, owing to the adhesions, it would have been almost impossible to remove the entire colon, and it is doubtful if such

a procedure would in any case have been of benefit to the patient; it would certainly have added to the risk. We can understand an ileosigmoidostomy as being justifiable in some cases, but with the colon draining at both ends it does not seem that anything could be gained by subjecting the patient to such a radical operation as the removal of the entire colon. If it is necessary to wash out the colon in order to prevent an absorption, which cannot be very marked from a fibrous tube, it would seem that an appendicostomy or a cecostomy would accomplish all that Sir W. A. Lane desires, without subjecting the patient to the great risk of the more radical operation. When the constipation is due to an angulation caused by an adhesion, the adhesion should be broken up and the raw surface subsequently covered by the peritoneum, after the manner of E. H. Richardson.

CONCLUSIONS.

1. Do not treat any case of constipation with cathartics and massage without first searching for the cause.

2. Acute and practically complete intestinal obstruction may occur without symptoms other than coprostasis and distention.

3. It is dangerous to introduce fluids into a paralyzed and overdistended bowel.

4. Typhoid ulcer may cause permanent stricture of the bowel, which at some more remote period may become malignant.

5. Adenocarcinoma may exist for a long time without giving symptoms other than constipation.

6. Adenocarcinoma may cause complete intestinal obstruction.

7. Limited glandular carcinomatosis is compatible with long-standing adenocarcinoma, especially in the sigmoid, and this fact renders the prognosis in such cases most encouraging.

AUTO-INTOXICATION.

AUTO-INTOXICATION is a toxemia caused by absorption from the intestines of poisonous substances which are the result of bacterial action on the end-products of protein digestion and increased bacterial virulence resulting from stasis.

In order that we may have a better understanding of this condition it will be necessary to review in brief the action of the stomach and intestines on the protein molecule. Hydrochloric acid and pepsin convert proteins into peptones and some of the lower cleavage products, such as polypeptids. They are next subjected to the action of trypsin and converted by it into amino-acids. When amino-acids become the prey of bacteria, highly toxic substances are formed which, when absorbed into the system, result in auto-intoxication. The proteolytic anaërobic bacteria which inhabit the lower portion of the ileum and cecum are also capable of hydrolyzing proteins and converting them into substances which are not ordinarily the result of enzymic digestion.

Nature has provided three lines of defense against the absorption of these poisons: the mucous membrane of the intestine, the liver cells, and the internal secretions.

It was shown by Herter and Wakeman that the living cells of the body, especially the hepatic and renal cells and the epithelial cells of the intestinal tract, have the power of absorbing considerable quantities of indol as well as of phenol and of tying them loosely in such a way that these bodies cannot be recovered by distillation. Owing to this property of the cells, by which they hold these aromatic bodies while subjecting them to oxidization and pairing, the nervous system is screened from the action of the toxins.

Etiology.—In considering the etiology of this disease one naturally thinks of the mouth as a possible source of infection.

We observe the opportunities that are offered in this cavity for the growth and development not only of the pathogenic micro-organisms, but also of anaërobes.

We are not prepared to say that this in itself is sufficient to cause intestinal putrefaction, but it certainly lays the foundation under suitable conditions. An imperfect mouth is bound sooner or later to end in caries of the teeth. Herter has shown that under more favorable circumstances than those we have mentioned, the mouth and teeth contain anaërobic proteolytic bacteria. We know that the hydrochloric acid of the stomach is capable of destroying microörganisms, and it has been shown by Harvey Cushing, of Baltimore, that some hours after a meal there are very few microörganisms in the stomach or the duodenum; but if the stomach constantly receives large supplies of organisms from the mouth the digestion of the individual is bound to suffer sooner or later, and a certain number of bacteria escape the sterilizing influence of the gastric juice to prey on the protein molecules later on.

Reams could be written on the subject of the proper care of the mouth and its influence on the health of the individual, but enough has been said to show the propriety of proper attention to the mouth, not only from the standpoint of cleanliness but also from the point of view of prophylaxis. The care of the mouth, even in infancy, is essential in order to avoid auto-intoxication undermining the constitution later in life.

The next etiological factor to be considered is the stomach. According to the physiologists only 7 per cent. of digestion takes place in the stomach. This region, from the stand-point of digestion, would seem to be an almost negligible quantity, but this is not so. The stomach has its functions, and in order that the health of the individual may be maintained it is necessary for the stomach to carry out its part of the work in an orderly manner.

We have spoken before of the action of hydrochloric acid in destroying bacteria. It has another influence on digestion, that of stimulating the flow of pancreatic juice when it reaches the duodenum. The stomach has to grind the food and prepare it for intestinal digestion and the food has to be served out to the small intestine in proper proportions. Here is where the question

of motility enters. We have always been taught that as long as the motility of the stomach is not interfered with everything goes well; that motility is the most important function of the stomach, and if motility is interfered with the whole digestive apparatus is bound sooner or later to be thrown out of gear. Increased motility causes diarrhea; diminished motility usually causes constipation; under either condition intestinal digestion suffers.

FIG. 142

Habitus enteroptoticus.   Normal habitus.
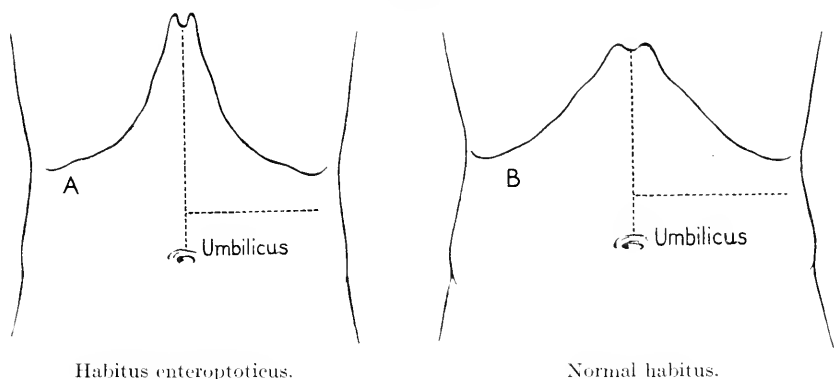
It is impossible in a single chapter to give a detailed description of the causes of indigestion; suffice it to say that stomach digestion is an important etiological factor and intestinal digestion is the most important etiological factor in auto-intoxication. As intestinal indigestion is probably the most frequent cause of auto-intoxication, a deranged nervous system with all its concomitant troubles—overwork, excessive use of alcohol and tobacco and so on—not alone predisposes but, by lowering the vitality and weakening the lines of defense, renders the individual more susceptible and a much smaller dose of indol, skatol, or phenol is required. This has been shown conclusively by Herter, Harland, and Wakeman. Overeating and lack of exercise, by throwing too much work on the liver and intestines, must be considered etiological factors.

Mention must be made of those who come into the world with apparently poor constitutions—those with the habitus enteroptoticus.

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According to Stiller, the normal habitus, or broad thorax, is differentiated from the so-called "habitus enteroptoticus," which is identical on the whole with the paralytic or phthisical habitus. The chief characteristics of the habitus enteroptoticus are the following: A long, small, and usually flat thorax; a narrow costal angle, so that the xiphoid process is the apex of an acute angle. In patients with a normal habitus this angle amounts to

Fig. 143

Enteroptosis. (Lynch.)

120 degrees or more. Where habitus enteroptoticus occurs the angle amounts to perhaps 60 degrees. The more acute this angle the more marked the habitus enteroptoticus, which is accompanied by a loosening of the costal cartilages, so that, usually, the tenth right and left ribs fluctuate; and in severe cases, the cartilages of the ninth right and left ribs also fluctuate.

In habitus enteroptoticus a vertical line drawn between the

ensiform process and the umbilicus is much longer than a line drawn at right angles to this vertical line and extending to the anterior axillary line. In normal habitus, on the other hand, this vertical line would be shorter than, or about of the same length as, the line perpendicular to it, extending to the anterior axillary line. Therefore, in habitus enteroptoticus the epigastrium and hypochondrium have a greater vertical than transverse diameter; while in normal habitus the transverse diameter of these regions considerably exceeds the vertical. This explains why it is that the organs occupying the epigastrium and the hypochondrium must assume a more nearly vertical position than normal.

Auto-intoxication is increased in the following conditions: Deficiency of hydrochloric acid; insufficiency of the pancreatic secretion or of the bile, some diarrheal conditions, as well as constipation, angulations of the intestines, adhesions and bridles, or obstruction of any kind that does not allow free passage of the chyme, as Sir Arbuthnot Lane has aptly put it. In all cases of auto-intoxication there is some obstruction to the ileal effluent.

Roos regards the toxins produced by bacteria in the intestines as the ones responsible for the symptoms of auto-intoxication. He quotes Strasberger, who has stated that one-fifth of the dried substance of the stool is composed of bacteria and that under pathological conditions the amount may be double. He says that it must be remembered that putrefaction may occur, not so much in the food particles in the intestines as in the serous fluid poured out from the intestinal wall, which is liable to putrefy.

Sir Arbuthnot Lane takes the stand that without some obstruction to the ileal effluent auto-intoxicantion cannot occur. He compares the gastro-intestinal tract to a drainage scheme of which the several portions perform several functions. If there is any delay to the passage of the contents at any stage there is a multiplication of bacteria, and organisms that are otherwise harmless become harmful and invade adjacent organs and there set up pathological processes such as for instance, inflammation of the gall-bladder, duodenal ulcers, nephritis, hardening of the bloodvessels; and changes in the thyroid gland, such as goiter. He quotes Carrel in support of his theory. Carrel, he says, has

shown that the death of the tissues is due to an inability to eliminate waste products, and that by draining them and supplying suitable nutrition, he can give them immortality. He says that obstruction first occurs at the point of normal fixation and that the second place may become kinked by acquired bands, which bands are a remedy on the part of nature to fix certain organs with the object of preventing angulation. This normal fixation at first is helpful; but after a time these fixed points prevent the normal flow of chyme through the intestines and as a consequence there is a damming back of the intestinal contents. This is first felt at the duodenojejunal junction resulting in dilatation of the duodenum, and then ulcers of the stomach follow.

It must be admitted that with stasis auto-intoxication is more likely to be pronounced, and that stasis due to bands and adhesions results in a more pronounced toxemia than in those cases where stasis is due to a dilated or atonic bowel. In support of this we can offer the conclusions of physicians and surgeons who have studied these conditions and who have undoubtedly seen many extreme cases of constipation, with no evidence of auto-intoxication. Another point that is worth remembering (one that has been frequently observed by the writer) is that some of the worst cases of auto-intoxication have been those associated with diarrhea.

One of the earliest cases that came under our observation was a woman who had what is now called *Lane's link*, but at that time was termed a simple adhesion. This woman suffered from a chronic diarrhea with an excessive discharge of mucus and occasional presence of blood and pus. For two years she had been under treatment in hospitals, with some improvement.

Examination of the stomach was negative. The use of the proctoscope showed only angulation of the sigmoid, with adhesions to a retroverted and flexed uterus.

The test diet was employed for four days, followed by the usual examination with the results herewith given:

Specimen of feces had a fluid consistency, a somewhat offensive odor, a normal color, and showed a gross admixture of mucus. Examination showed blood, pus, mucus, and superficial epithelium

with much granular detritus and very little food remnants; the bacterial flora was excessive and chiefly Gram-negative, and ova and tubercle bacilli could not be found. (Albumin putrefaction.)

The analysis of a twenty-four-hour specimen of urine was: Urea, 1.76 per cent., 12.472 gm; indican, marked excess; specific gravity, 10.15 at 15° C.; acetone, traces; chlorides, 0.6 per cent.; mucus, small amount; total sulphuric acid, 1.0584 gm.; mineral sulphuric acid, 0.8655 gm.; ethereal sulphuric acid, 0.1929 gm.; ratio mineral and ethereal sulphuric acid, 4.5; total nitrogen, 9.524 gm.; urea nitrogen, 5.905 gm.; (60 per cent. total N.); uric acid nitrogen, 0.129 (1.5 per cent. total N.); ratio urea and uric acid nitrogen, 42.5; ammonia nitrogen, 0.907 (9.5 per cent. total N.); diacetic and betaoxybutryic acids, absent.

The specimen was found to contain a faint trace of albumin, but no renal elements microscopically. A rather small amount of daily urine, a normal specific gravity and a somewhat low daily excretion of the urea. The sulphate ratio was much depressed and the specimen contained a marked excess of indican. The nitrogen partition was also faulty and traces of acetone were present. Capillary constant (stalagmometer) 1.4.

On opening the abdominal cavity a loop of the small intestine near the ileocecal valve was found imbedded in the adhesions.

This case has demonstrated that a kink of the small intestine results in severe auto-intoxication; and that a Lane kink is very frequently associated with diarrhea. All this evidence goes to prove that, while the statement of Sir Arbuthnot Lane as to the etiology of auto-intoxication may seem exaggerated to those not familiar with such cases as the one just related, to those who have observed all the sequelæ of these cases it seems well within the limits of common sense.

Pathology.—The pathology of auto-intoxication is the pathology of most of the disease to which we are heir. As a result of stasis and auto-intoxication, we have increased bacterial growths, with a lowered vitality of the cells of the mucous membrane of the bowel. Lowered vitality means lowered resistance, with ulceration and increased toxemia; then a vicious circle is established, and every one is familiar with the end-results of auto-intoxication.

Symptoms.—The patient, after the disease has existed for some time, is pale with a sallow complexion and lusterless hair. The tongue is coated in the centre and red at the edges. The veins are prominent and dilated. He suffers from irregular appetite, anorexia, and often from intestinal colic, from periodical attacks of headache and diarrhea, inability to concentrate the mind, loss of memory, and a tired feeling. He feels drowsy and sleepy most of the time; is constipated between attacks, suffers from muscular weakness, increased arterial tension, arterial sclerosis, and is very easily depressed.

Diagnosis.—To make a positive diagnosis of auto-intoxication the patient should be put on the Schmidt and Strasburger diet for three days. At the end of this time the feces should be examined. The urine should be kept for twenty-four hours and also examined. The urine examination should include a careful nitrogen and sulphate partition. In this way we are able to tell how much absorption is taking place. A great deal of putrefaction may exist in the intestine without the patient feeling any symptoms of auto-intoxication, but if there is any absorption it will be indicated by the urine analysis.

It may be well to give here an idea of the significance of the sulphate and nitrogen ratio.

The sulphur in the urine is chiefly oxidized and is excreted in two forms, known as the preformed sulphates and the combined sulphates—the latter being also called ethereal or conjugate sulphates. The sulphur in these sulphates is derived chiefly from oxidization of the proteid material of the food, and about nine-tenths of it combines with the alkalies present in the body to form the preformed sulphates, while the other tenth unites with substances of the aromatic group, chiefly indoxyl, cresol, phenol, and pyrocatechin, to form the conjugate sulphates.

There is also a form of sulphur which is not oxidized, viz., neutral sulphur, and this appears in the urine in combination as sulphocyanides, thiosulphates, oxyproteic and alloxyproteic acids, taurin, taurocarbamic acid, and, more rarely, as cystin. The neutral sulphur may form 10 to 25 per cent. of the total sulphur in the urine in health. Inasmuch as the sulphur content of the albuminous substances of the food varies considerably, the

nature of the proteid taken in will alter somewhat the amount of neutral sulphur. When there is any diminution of oxidization in the body, as in poisoning by phosphorus, arsenic or alcohol, the neutral sulphur is increased, owing to the diminution in the oxidizing power of the tissues. The excretion of neutral sulphur is also increased in hunger and in pneumonia. An increased excretion has been noted in icterus, owing to the absorption of the sulphur compounds from the bile, and occasionally in cirrhosis of the liver with marked jaundice. The study of the excretion of neutral sulphur has as yet furnished no facts of clinical importance.

Relative increase of the ethereal sulphates may be due to one of several causes, chief among which may be cited stasis in the bowel, ingestion of decomposing nitrogenous food, improper digestion of food in the stomach and small intestine, by diminution or absence of hydrochloric acid and bile, the result of excessive or faulty bacterial fermentation in the lower portion of the small intestine and the upper portion of the large intestine. This process may exist without an actual toxemia, and an actual toxemia may exist without this particular putrefactive process, but they are usually associated.

A relative ethereal sulphate excess is commonly associated with an excess of indoxyl sulphate, though not invariably so. Without means of estimating the presence or the amount of the actual products of toxemia, the relative excess of ethereal sulphates is used as a guide, although subject to errors as are other guides.

Faulty nitrogen partition would seem to justify the inference that the hepatic function is disturbed. The decrease in the relative amount of urea nitrogen probably indicates the degree of fault. With this decrease there is a relative increase in the amount of one or more of the other forms of nitrogen in the urine. In the severe toxemias of pregnancy, pneumonia, etc., this is chiefly in the so-called ammonia nitrogen or creatinin nitrogen; in digestive disturbances the increase is mainly in the so-called extractive nitrogen; and in lithemic cases and in those of cyclic vomiting, headache or albuminuria, in the purin nitrogen as well, particularly during the acute attack. In cases of enteritis or colitis, owing to the destruction of cells, the purin nitrogen is often increased.

Faulty nitrogen partition may exist without a toxemia, but a hepatic toxemia without a faulty nitrogen partition is practically unknown. Acidosis frequently accompanies a faulty nitrogen partition, but it would seem an evidence of toxemia rather than of the fault in hepatic function, though this is disputed by some.

The fact that the disturbed metabolism is the result rather than the cause of the toxemia, and that it may occur without toxemia even in mere starvation, makes the subject complex.

Of course, nowadays, the x-ray examination throws more light on this subject than any other one method we know. Therefore in all cases where we have an auto-intoxication, the patient is given a bismuth meal, and this bismuth meal is followed for three days. At the end of this time we can determine absolutely whether a patient has an obstruction to the ileal effluent or not.

Complications.—Some of the complications observed are acne, eczema, pruritus, furunculosis, and pigmentation of the skin.

One case seen had an intense itching all over the body, with mucous colitis, erythema, and marked auto-intoxication. The patient was put on a suitable diet and the itching disappeared.

A great many disturbances are attributed to auto-intoxication by Dr. Hiram Wood, of Baltimore.[1]

Professor Grawitz claims that certain types of pernicious anemia are unquestionably caused by auto-intoxication and he has shown that a suitable diet in conjunction with proper medication has resulted in the cure of a great many cases.

Treatment.—In order to treat a case of auto-intoxication intelligently a correct diagnosis must first be made. As we have shown in the early part of this chapter, there are a great many causes for this condition and even if a patient is put on a suitable diet and the auto-intoxication is relieved for the time being, still, unless the underlying cause is removed, or the diet continued indefinitely, the patient will have a recurrence of the trouble. For instance, if it is due to an insufficiency of the pancreas or liver, suitable measures must be instituted, otherwise the treatment will be faulty. If it is due to angulation or adhesions these must be treated by appropriate surgical measures. Of course, the principles observed in the treatment of this disease are (1) to reduce the

[1] Journal of the American Medical Association, August 13, 1910, p. 559.

proteins to a minimum, (2) to change the bacterial flora, (3) to maintain the body weight by increasing the carbohydrates and fats and seeing in this way that the caloric value of the foodstuffs is sufficient to supply energy to maintain the equilibrium. There are certain foods that answer the total purpose of changing all bacterial flora and supplying energy; such foods as give off lactic and succinic acids, as rice, noodles, macaroni, spaghetti, vermicelli, and sauer-kraut. Sauer-kraut is particularly indicated on account of the quantity of lactic acid carried with it into the lower bowel. For this reason a diet of sauerkraut might be strongly indicated in some cases. Recently some authorities claim that the presence of excess of lactic acid in the system results in arteriosclerosis; if this is so, a man with auto-intoxication is between the devil and the deep sea.

Medicinal Treatment.—Ichthyol has a decided anti-putrefactive effect. For this reason ichthyol in doses of $2\frac{1}{2}$ grains, three times a day after meals, is given. If the patient can stand it, it should be gradually increased up to two or three pills three times a day. There are a number of combinations which are used as substitutes for ichthyol, namely, ammonium ichthyol sulphate; ichthalbin, 5 to 15 grains; ichthargan, about the same doses, 5 to 15 grains three times a day. Calomel, in small doses, and often repeated, is a very valuable intestinal antiseptic. We have been in the habit of giving it combined with sodium bicarbonate. In cases of intestinal putrefaction, $\frac{1}{10}$ of a grain of calomel with 1 grain of sodium bicarbonate, given every fifteen or twenty minutes until ten doses have been taken, is very effectual. Of course, the trouble with calomel is that it cannot be repeated frequently; but it is particularly useful three or four days before an operation, especially were there is a pronounced auto-intoxication. Argyrol in doses of 5 grains three times a day seems to be very effectual in some cases. Russian mineral oil, known as English paraffin, when it agrees with the patient, is an exceedingly good drug in the treatment of auto-intoxication. We have found from experience that those who have been treated with Russian mineral oil fall into three classes: The first class, patients on whom the mineral oil has no effect and is evacuated unconsciously, causing a great deal of inconvenience; second class, those in whom

the oil causes indigestion with an increase rather than a diminution of the auto-intoxication; third class, those with whom the oil agrees and causes one or two natural movements daily. After it has been used for a short time it can easily be determined whether the oil is indicated or not. In the first and second classes the oil should be immediately discontinued.

In connection with medicinal treatment, we might mention fermented milks, such as zoolak, koumyss, and fermilac. All these fermented milks, if properly and freshly prepared, are excellent adjuvants. It must be remembered that when there is a marked delay in the passage of the stomach contents, fermented milks are contra-indicated.

Relative to the subject we have just mentioned, it might be well to draw attention to the lactic acid bacillus, though by now most people are familiar with its influence on auto-intoxication. This bacillus can be given in tablet form, or in solution. The writer has not found this form of treatment very lasting.

Treatment by Lavage.—There are several drugs which have a decidedly antiputrefactive effect when administered in solution. Lavage has many advantages over ingested drugs in that it more easily reaches the seat of the trouble, namely, the cecum, and this is in a great many cases the habitat of the anaërobic proteolytic bacteria.

We would mention first and foremost ichthyol, a 1 per cent. solution; next, peroxide of hydrogen, 2 per cent. solution; after these two, tannin in a solution of 1 to 500 is sometimes very effective.

It might be well to observe, in connection with lavage that the capacity of patients varies between one and two quarts. In patients who have not had previous experience with this form of treatment a small quantity should be administered at first, say one pint, at body temperature. This can be gradually increased up to one and possibly two quarts. A great deal of pain follows the introduction into the bowel of over two quarts of any fluid. The patient has a feeling as if the bowel were about to rupture, and, in many cases, suffers great agony until the distention is relieved. Another point worth remembering is that enemas should be used cautiously in patients suffering from

cardiac disease. Enemas should never be administered directly after meals as they are apt to cause nausea and disturb digestion. The most suitable time for lavage is about one or two hours before meals.

Oxygen, in our hands, has given excellent results in the treatment of auto-intoxication. It is used in the following manner: The patient is placed on his right or left side, whichever is the most convenient, and a small catheter passed into the rectum. The tube from the tank is attached to the catheter and the oxygen is allowed to flow in gradually. If there is any pain or distention the oxygen is temporarily discontinued, as it has been found in some cases to set up a slight spasm of the bowel; but this should not deter one from continuing the treatment. By temporarily discontinuing the flow of oxygen, from time to time, spasms will be avoided and the best results obtained. After a while the patient himself can regulate the apparatus and most patients are able to treat themselves in time.

SCHMIDT'S TEST DIET.

We have found that Schmidt's test diet gives very good results in many cases.

On arising 0.5 liter milk (or, if milk does not agree with the patient, 0.5 liter of cocoa prepared from 20 gm. cocoa powder, 10 gm. sugar, 400 gm. water and, 100 gm. milk).

Breakfast: 0.5 liter oatmeal gruel (made from 40 gm. oatmeal, 10 gm. butter, 200 gm. milk, 300 gm. water); zwieback or toast made from stale bread; 1 egg cooked as preferred (except fried); two butter balls.

At noon, 125 gm. chopped beef (raw weight) broiled rare with 20 gm. butter so that the interior will remain raw; also 250 gm. potato broth (made of 190 gm. mashed potatoes, 100 gm. milk and 10 gm. butter). No bread.

In the afternoon, milk or cocoa.

In the evening, same as breakfast.

This furnishes about 2247 calories.

As we are in a habit of putting all patients on a test diet to

begin with, before examining the urine and feces, we have found it advisable to continue this diet in a great many cases of auto-intoxication, with some additions and subtractions, either to suit the idiosyncrasies of the individual or when we deem it advisable to eliminate meat from the diet and substitute vegetables or some other carbohydrate food.

We have been surprised to learn during our numerous investigations of these conditions that the sulphate ratio can be raised in these cases without eliminating meat entirely. We found that meat, as demonstrated in the Schmidt test diet, chopped very fine, is easily digested, except in those cases where the hydrochloric acid is very much diminished or entirely absent, and such cases do not form a large percentage of auto-intoxicants.

We have, therefore, in a great many of our cases, used this test diet of Schmidt's as a nucleus, gradually building around it as the auto-intoxication diminishes.

For the benefit of those of our readers who wish something more definite in the way of dietary and for those who are not experienced in the treatment of this trouble, we give a number of menus as suggested by Combe in his work on auto-intoxication.

FARINACEOUS DIET WITHOUT MEAT.

This diet is employed when a chronic enteritis is not completely subdued, and when it still presents frequent acute exacerbations.

7.30 A.M.   Breakfast: Thick broths made of Knorr or Maggi creams or lactated flours and prepared with either water or milk.

Small rolls.

Fresh butter, unless contra-indicated by pyrosis or diarrhea.

From 8 to 9 A.M.   Rest in horizontal decubitus.

10 A.M.   Lactated flour, made either with water or milk, but no solid food.

12.30 P.M.   Lunch: One or two yolks of eggs (raw or soft boiled.)

Alimentary pastes (macaroni, vermicelli, etc.) with fresh butter.

Pudding.

Rolls.

Fresh butter.

Nothing to drink.

One or two hours' rest lying extended without sleeping.

3.30 P.M. Light lunch.

Lactated flour made with either water or milk, Évian spring water, but no solid food.

7 P.M. Dinner: One or two yolks of eggs.

Alimentary pastes.

Pudding.

Rolls and fresh butter.

Nothing to drink.

8 to 9 P.M. Rest, lying down without sleeping.

10 P.M. Infusion of chamomile, peppermint, fennel, anise, or orange-flower water, etc.

Glass of Évian spring water.

After eight or ten days of this regimen add to the lunch and dinner either purée of potatoes or baked potatoes, and either the juice or jelly of whortleberries.

When the liver is involved, leave out the egg yolks.

The diet will then remain purely lactovegetarian.

FARINACEOUS REGIMEN WITH MEAT.

This regimen is used in membranous enteritis when it has completely subsided, and it must be considered as the therapeutic diet for the first six months of treatment.

7.30 A.M. Breakfast: Soup prepared with milk or water.

Lean ham (50 grams).

Rolls or zweiback.

Fresh butter.

8 to 9 A.M. Rest, lying down extended without sleeping.

10 A.M. Oat cocoa or Kneipp coffee, with milk, according to choice.

No solid food.

12.30 P.M. Lunch: Roasted or broiled meat without gravy or sauce (50 grams).

One or two egg yolks.

Alimentary pastes or rice.

Potatoes mashed or baked.

Pudding.

Whortleberry juice or jelly.

Rolls.

Fresh butter.

Nothing to drink.

One and a half to two and a half hours' rest, lying down without sleeping.

4 P.M. Refreshment: Kneipp coffee, oat cocoa, or Évian water, according to choice.

No solid food.

7.30 P.M. Roasted or broiled meat, hot or cold (50 grams).

Alimentary pastes.

Potatoes mashed or baked.

Pudding.

Whortleberry juice.

Rolls.

Fresh butter.

Do not drink and eat less than at lunch.

8.30 to 9.30 P.M. Rest, lying down.

10 P.M. Infusion (chamomile, anise, peppermint, etc.).

7.30 A.M. Breakfast: Tea or oat cocoa, according to choice.

Lean ham, 50 grams.

Rolls or zweiback.

Fresh butter.

8 to 8.45 A.M. Rest, lying down.

10 A.M. Kneipp coffee.

Do not eat.

12.30 P.M. Lunch: Roasted or broiled meat.

One or two egg yolks.

Alimentary pastes.

Vegetable purée (beans, peas, etc.), or mashed potatoes, according to choice.

Pudding.

Cup custard or whortleberry juice or jelly, according to choice.

Rolls.

Fresh butter.

Do not drink.

Rest, lying down for one and a half hours to two and a half hours without sleeping.

7.30 A.M.   Breakfast:

Tea, oat cocoa, café au lait, Kneipp, according to choice.

Lean ham, or cold meats, 50 grams, according to choice.

Rolls or toast.

Fresh butter.

8 to 8.30 A.M.   Rest, lying down.

10 A.M.   Rest, lying down.

12.30 P.M.   Lunch.

Fresh egg yolks, fish courted bouillon, roast or broiled meat, according to choice.

Alimentary pastes, vegetable purées, according to choice.

Green vegetable purée.

Pudding, custard, fruit purée, according to choice.

Rolls or toast.

Fresh butter.

Beverage, 50 to 100 grams.

Rest, from one and a half to two hours, lying down.

4 P.M.   Refreshments: Either weak tea or café au lait, Kneipp.

Dry biscuits or wafers (Marie, Albert, Palmer).

7.30 P.M.   Dinner.

Same as lunch.

Soft-boiled or scrambled eggs, roasted or broiled meats, boiled fresh fish, butter sauce, according to choice.

Alimentary pastes, vegetable purées, green vegetable purées, according to choice.

Puddings.

Custards.

Fruit purées, fruit jellies, according to choice.

Toast.

Fresh butter.

Beverage, 50 to 100 grams.

8.30 to 9 P.M.   Rest, lying down.

10 P.M.   Infusion.

There is no drug that we know of, outside of calomel, that has influence on intestinal putrefaction; the treatment is lavage.

CHAPTER XXV.

COLOSTOMY AND ILEOSTOMY.

Colostomy.—Colostomy is an opening made in the bowel, after it has been attached to the abdominal wall, having for its object the sidetracking of the fecal current, temporarily or permanently, because of some pathological lesion below the opening. Fortunately there are not many conditions which necessitate such radical means for their relief. Its usefulness has been curtailed considerably since the advent of appendicostomy and cecostomy. It is now very seldom indicated except in lesions below the descending colon, because in conditions above this we can accomplish the same result with a lateral anastomosis and save the patient the depressing influence of this operation. Especially is this so when we consider that notwithstanding the ingenuity of modern surgery, no operation has been devised that offers any degree of security to the patient from fecal incontinence. In a word, continence is the exception rather than the rule. Is it to be wondered at, then, that so many patients prefer to take the risk of the radical operation rather than to submit to a colostomy? However, "beggars cannot be choosers," and to unfortunates beyond the reach of the knife this operation, notwithstanding its drawbacks, affords relief from pain and other distressing symptoms which are part and parcel of the conditions which call for this operation. Before the days of antiseptic surgery, when few surgeons had the temerity to enter the abdomen, lumbar colostomy was very popular; but it has outlived its usefulness and is now seldom spoken of except to be mentioned in connection with operations that have been abandoned.

Temporary Colostomy.—The patient having been previously prepared as for any laparotomy and the site of the opening settled, a vertical incision is made on the outer side of the left rectus muscle through the skin and subcutaneous fat, and later through

the fascia; the rectus muscle is next retracted to the inner side
when the transversalis fascia and peritoneum come into view;
all bleeding-points are caught by means of artery forceps and then
the peritoneum is lifted up between two pairs of thumb forceps,
the assistant holding one and the operator the other.   Between

Fig. 144
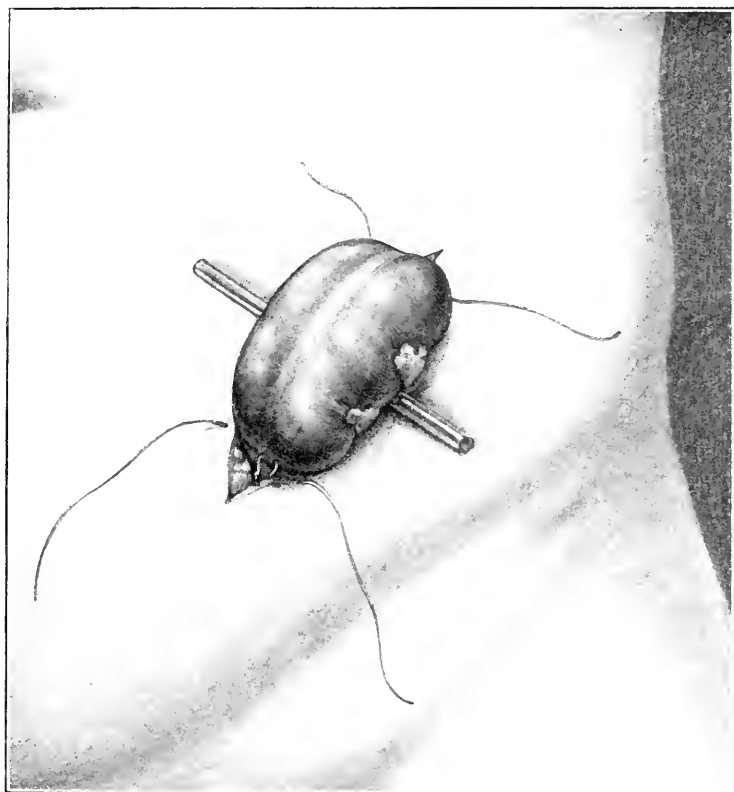
Temporary artificial anus.   (Lynch.)

the two forceps a slit is made in the peritoneum and it is then
clamped on each side by artery forceps; by gradually elongating
the opening, as the peritoneum is lifted up, injury to the intestines
will be avoided. The operator now passes his gloved hand into
the abdominal cavity and locates the portion of the large intestine
which he wishes to fix. This is brought outside the abdominal

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cavity and caught by an assistant, and the gut pulled down in order to prevent subsequent prolapse. A bloodless spot in the mesentery is selected and through this space a pair of forceps is passed; the forceps are opened and a glass rod inserted; the rod drawn back through the opening acts as a support for the bowel. Under either end of the glass rod a piece of gauze is placed to prevent it from injuring the skin. The peritoneum is sewed around the bowel by means of 4 to 6 interrupted plain catgut sutures, and the wound is then closed by silkworm-gut sutures which are passed through the skin, fascia, and back again through the fascia and skin. In this way the wound is closed snugly around the bowel. Finally, a piece of rubber tissue is wrapped around the bowel to prevent anything adhering to it, and over this some gauze, which is held in position by adhesive straps. Of course the straps should not be placed over the bowel. While we do not, in all cases, agree with those surgeons who advocate colostomy preliminary to a more radical operation, we can see the utility of it in certain phases. It, of course, affords the surgeon an opportunity to make an examination of the abdominal contents and of the extent of the pathological lesion, so that if a future operation is contemplated he has a fair idea of what can be accomplished with safety, and this opportunity is particularly valuable in case a malignant growth exists, because it can then be determined accurately whether neighboring organs such as the bladder and uterus are involved; above all, the extent of glandular and liver involvement. He can further determine whether the sigmoid is sufficiently long and healthy, so that the continuity of the bowel may be restored later; and last, but not least, it can be settled whether the opening shall be made in the sigmoid or in the transverse colon.

Permanent Colostomy.—This operation is resorted to only in those cases where all other procedures are contra-indicated and with the object of sidetracking the fecal current to save the patient from intestinal obstruction; so that, as in malignant conditions, the patient's life may be prolonged and his remaining days made fairly comfortable. It is also performed in those cases of benign tubular stricture where it is impossible to do anything in the way of a radical operation and restore the continuity of the bowel

to the anus, and is used in other cases when, owing to the age of the patient, it would be folly to try anything but the simplest operation. Then again, the condition of the patient may be such, either because of some wasting disease or involvement of heart or kidneys, that there is no hope of doing more than to prolong his life temporarily, or relieve him for the moment of distressing conditions.

Several colostomy operations have been devised with the object of improving the patient's control over the movements of the bowels; but the results, so far as we can judge, have not been all that the patient craved or the surgeons who devised them hoped to accomplish. For this reason we have selected for description only those operations which, in our opinion, have given the best results.

Tuttle's Operation.—An incision is made through the skin and superficial fascia in a line with the fibers of the external oblique muscle, about an inch above and one and a half inches inside of the anterior superior spine of the ilium. It should be about three inches long. The fibers of the external and internal obliques are separated by blunt dissection. Blunt retractors are placed in the wound and held in position by an assistant; then the transversalis fascia and peritoneum are picked up and incised in a line parallel with Poupart's ligament.

After abdominal exploration has been carried out with the hand and a permanent inguinal colostomy has been finally determined upon, a loop of sigmoid sufficiently long to be drawn at least two inches outside of the abdominal cavity is selected, and a tape or loop of large silk is passed around it through a small slit in the mesentery, the ends being left long and held by an artery forceps. The lower fibers of the external oblique are then pulled downward, and the internal oblique split laterally to the distance of about three-quarters of an inch. A canal is then made between the skin and the external oblique downward to the extent of about two inches, opening through an incision in the skin above Poupart's ligament. This canal and incision should be large enough to admit of the loop of sigmoid being drawn through them without much compression. With the aid of the dressing forceps the knuckle of gut is then dragged

through the lateral slit in the internal oblique and downward through the canal outside of the external oblique muscle until it emerges at the inferior opening in the skin. It is held in this position by the passage of a glass rod through the opening in the mesentery, or by suturing it to the edges of the skin wound. The

Fig. 145
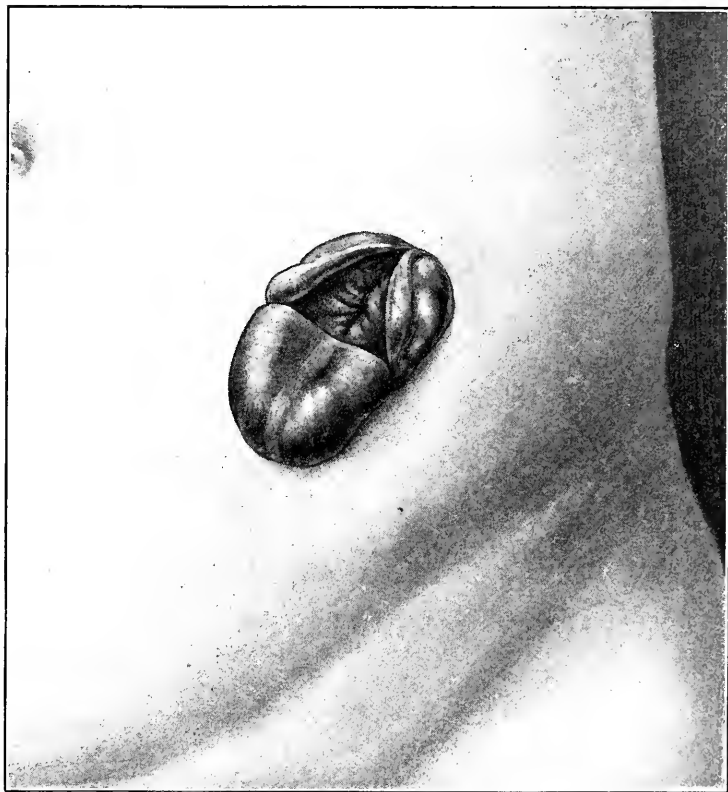
Second stage of method of opening gut.   (Lynch.)

abdominal wound is then closed by chromicized catgut sutures in the muscular layers and a subcutaneous silk suture in the skin, afterward being sealed by iodoformized collodion and dressed with sterilized gauze, over which a layer of rubber protective tissue is placed and sealed to the skin with chloroform. The latter precaution is taken to avoid infection of the primary wound

through the escape of feces when the gut is opened. If necessary, the loop of the intestine may be opened immediately; but, ordinarily, it is better to wait twenty-four to forty-eight hours before doing so. This is accomplished by a simple slit in the line of the longitudinal fibers of the gut. After ten days or more, the protruding portions of the gut should be trimmed down flush with

Fig. 146
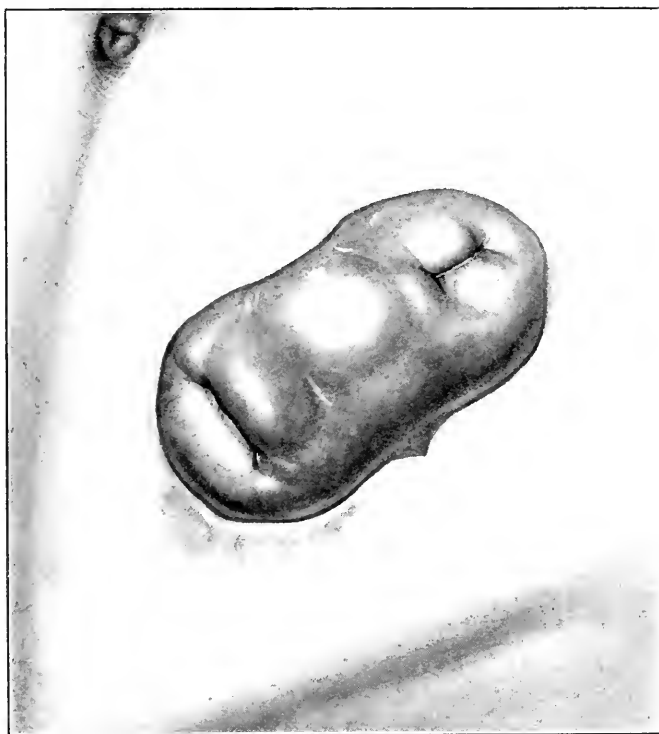
Artificial anus. (Lynch.)

the skin and the artificial anus will present itself as a double-barrelled aperture, one opening of which connects with the proximal and the other with the distal end of the sigmoid. The gut is brought outside of the external oblique muscle in order that it may rest upon a resisting plane, and a truss or compress can be placed upon it; thus absolutely occluding its caliber. Being passed through the slit in the internal oblique, it is surrounded

by muscular fibers, and thus obtains a certain amount of voluntary control. In the majority of cases no compressing apparatus is necessary, as the patient usually possesses almost complete continence without it. When it is necessary, an ordinary single spring hernial truss with an elongated pad placed somewhat outside of the usual position, serves every purpose.

Fig. 147
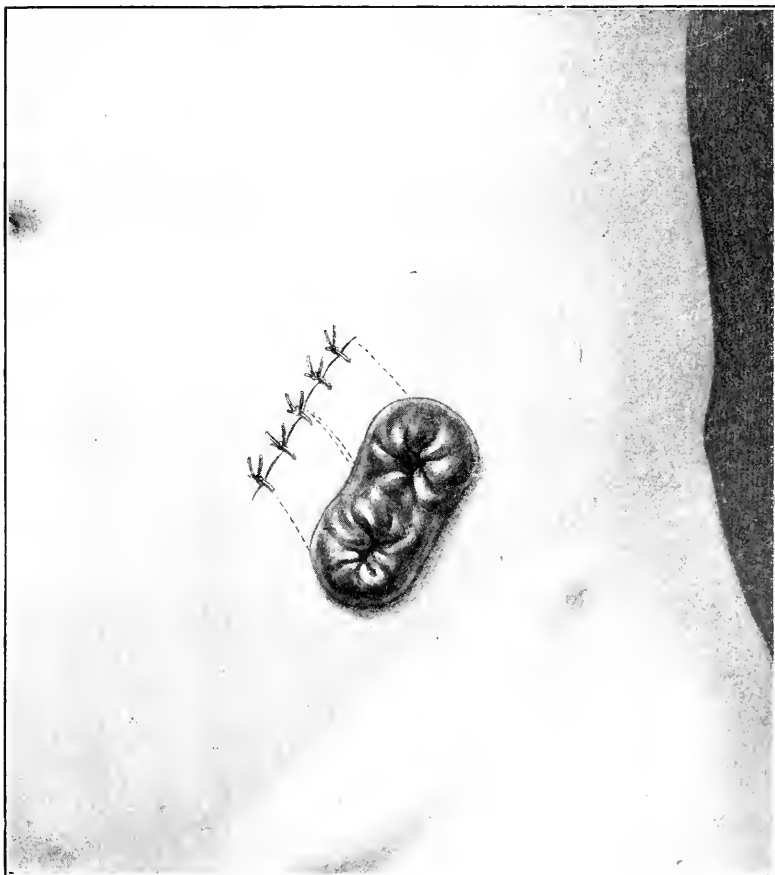
Permanent artificial anus. (Lynch.)

Lynch's Operation.—The author's method is much the same as Tuttle's, but has some modifications. Instead of bringing the gut through a slit in the internal oblique and then under the skin,

the gut is brought out through the wound and held in place by an assistant. A bundle of muscle fibers is separated from the lower lip of the external oblique and the gut is pulled through this opening by forceps. From the upper lip another bundle is selected and the gut again pulled through the upper opening. In this way a regular figure-of-eight sphincter is formed. The wound is closed by one or two silkworm-gut sutures on each side, which include the skin and superficial fascia, and the operation is complete. The intestine is opened immediately, if necessary, and a Paul tube inserted and held in place by a purse-string suture. At the end of ten days the intestines are cut flush with the skin and the edges sewn with a continuous plain catgut suture.

Fig. 148
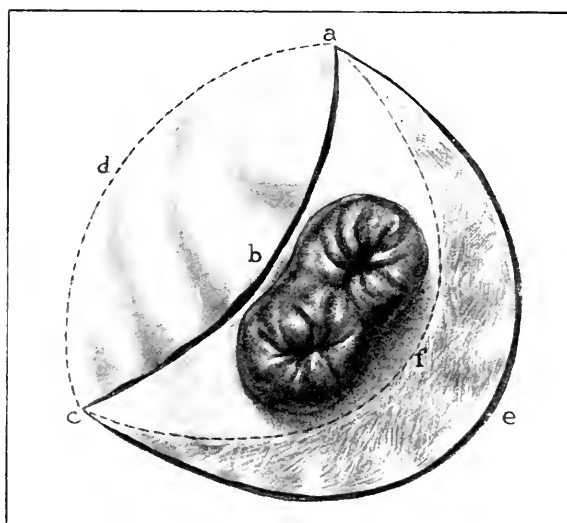
Method of closing artificial anus. (Tuttle.)

The Indications for Colostomy.—1. Inoperable carcinoma of the rectum or sigmoid.

2. Stricture of the rectum or sigmoid.

3. Multiple polyposis with severe hemorrhage.

INOPERABLE CARCINOMA OF THE RECTUM OR SIGMOID.—There is no questioning the fact, which is borne out by clinical experience, that in inoperable cases of malignant disease of the rectum the

patients are made comfortable by colostomy. These patients very often gain in weight and live for several years in comparative comfort. We are of the opinion that when the tumor is situated in the sigmoid and is inoperable because of glandular or liver involvement, or because of the patient's condition, it is much wiser to implant the ileum in the rectum, following the method advocated by Kelly, or by lateral anastomosis, if the tumor is situated higher in the colon, than to leave the patient with a

Fig. 149
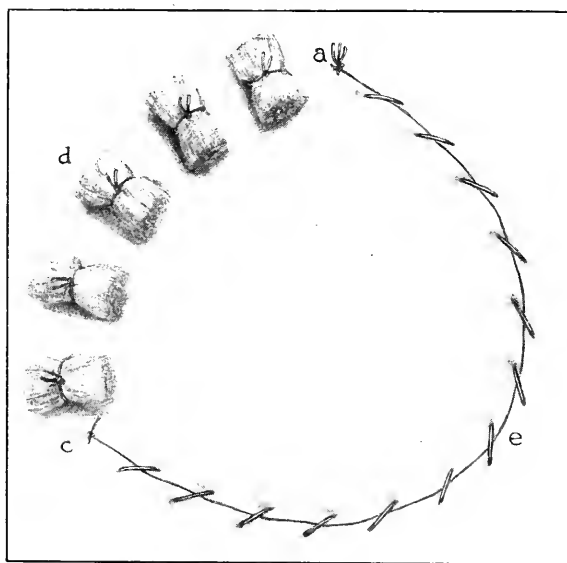
Method of closing artificial anus. (Tuttle.)

colostomy. We have had occasion to do this operation on several occasions and have been pleased with the results. One case in particular is of interest:

An old lady, referred by Drs. William Donovan and Harlow Brooks, was threatened with intestinal obstruction because of a tumor situated in the cecum and ascending colon. The woman's condition was not such as to encourage a very extensive operation, but she had to have some relief, and that immediately. We opened the abdomen and made a lateral anastomosis between

the ileum and the transverse colon. The woman was out of the hospital two weeks after the operation and has been attending to her household duties ever since; she is comfortable, and we are convinced that we have given that patient more satisfaction than we could possibly have done had we left her with the colostomy or tried the radical operation. It is now three years since this operation was performed.

Stricture of the Rectum or Sigmoid.—1. Colostomy is indicated in stricture of the rectum when the patient's life is threatened with intestinal obstruction and immediate relief is demanded.

2. It is also indicated where the tube is still patent, but owing to the diminished caliber the bowels are not thoroughly emptied and an added toxemia demands short-circuiting of the current in order to get the patient into better condition before proceeding with more radical measures.

3. The third indication is where there is an accumulation of pus owing to ulceration. Under such circumstances it seems wiser to make an artificial anus, because, if an operation is attempted, infection would almost enevitably result in the formation of connective tissue and would negative the purpose for which the operation is performed.

4. It is wise to perform a colostomy in cases of annular stricture, because otherwise it would be impossible to tell how far the process extends, and might result diasastrously were a radical operation attempted. This was forcibly brought before us in a case of Professor Tuttle's which he has since reported.

Multiple Polyposis.—Sometimes, owing to severe hemorrhage in multiple polyposis of the rectum and sigmoid, the patient's life is in danger. A colostomy, under such circumstances, would very often save him. We had such a case under observation this year, but, unfortunately, the patient was in such a reduced condition when brought to us that it was hardly possible to hope for a favorable result. The colostomy was done under gas in about ten minutes, and, though the patient died three weeks afterward as a result of inanition, the colostomy made her very comfortable during the few days she had left; and we are convinced that had we seen her earlier her life would undoubtedly have been saved.

Points to be Observed in Doing a Colostomy.—1. Always pull the upper end of the bowel down until it is taut, as by so doing a subsequent prolapse is avoided. If a prolapse occurs it is *certain* to make the patient's life miserable, and may possibly end his life. Incidentally, should he survive, his condition stands as a monument to the ignorance of the surgeon.

2. It has been shown by Lenander, and is borne out by our experience, that when the mesentery is pulled pain results. It is therefore easy to remember that an intestine with a short mesentery is not suitable for a colostomy. It will cause the patient untold suffering and most certainly result in failure, the colon later on retracting and the colostomy closing. Therefore, if the sigmoid is found unsuitable the transverse colon should be selected.

3. Because of failure to find a suitable space, the fecal matter finds its way into the distal opening, causing the patient great inconvenience and very often obviating the purpose for which the colostomy was performed. Difficulties, almost insurmountable in some cases, are experienced in doing this operation. We have met some cases where, owing to inflammation and adhesions, it was next to impossible to get hold of a portion of the colon sufficiently long in which to form an artificial anus. This condition has been met with on more than one occasion in malignant conditions and also in stricture. We had a case, recently, where the sigmoid was so twisted and bound down by adhesions that the bowel was in such a condition that it was with the greatest difficulty the colostomy was performed.

In very fat subjects many obstacles are encountered. In the first place, it is with much difficulty that the small bowel can be kept in the abdomen, and to those not experienced the transverse colon may be mistaken for the sigmoid when it it prolapsed. In these subjects, if great care is not exercised, a hernia will result. Suppuration of the wound with fistulous tract occasionally occurs if the operator's technique is not perfect.

When the Bowel Should be Opened.—When the bowel should be opened depends in a great measure upon the exigencies of the case. If intestinal obstruction is threatened it must be opened immediately, and, in our opinion, Paul's tube permits a safe opening

without much danger of infection. If there is no immediate haste we may make the opening on the fifth day after operation. As a matter of fact there is little danger attached to the opening of the bowel after forty-eight hours; by carefully wrapping same rubber around it infection of the wound may be prevented. If an accumulation of gas causes the patient any great inconvenience it may be relieved by puncturing the bowel with a fine trocar and cannula, which can be held in place by a suture until such time as the surgeon is ready to make the final opening. The opening of the bowel, following this operation, is very important, because if it is properly performed it is easier to close it later on. We think the procedure advocated by Tuttle is the best; it has given the most satisfaction in our hands. The gut is opened in the following manner: First, by a transverse incision which bisects the gut. From the middle of this incision a vertical incision is made which extends to the apex of the upper bisected portion of the gut.

"By this means the triangular flaps in the upper segment roll backward and curl up like dry leaves. The straight flap in the lower segment falls downward and inward, practically closing the lower aperture. The fecal discharges are thus carried outside the abdominal cavity and there is scarcely any possibility of their escaping into the lower segment. In addition to this no portion of the intestinal wall is sacrificed; and when it becomes advisable the artificial anus can be closed by simply suturing the edges of the T-shaped wound together without opening the peritoneal cavity. At the same time the lower segment may be opened by merely lifting up the transverse flap, thus furnishing an opportunity for irrigation and treatment of the parts below so long as it is necessary." (Tuttle.)

When the Opening Should be Closed.—This depends entirely on the conditions that demand this procedure, and must be left entirely to the judgment of the surgeon in charge. After it has served its purpose, it may be closed at the convenience of the patient, and when in the judgment of the surgeon there is no contra-indication to so doing. But he should not be influenced by the desires of the patient and try to close the opening until he is absolutely certain that all symptoms for the relief of which

this operation has been performed have disappeared; and until, in his judgment, it can be done with absolute safety, with no risk of a recurrence of the pathological lesion.

Ileostomy.—An ileostomy is an opening made in the ileum close to the ileocecal valve, and has as its object the side-tracking of the fecal current because of some pathological lesion in the colon. We formerly believed that an ileostomy was rarely indicated because the chyme in this region is fluid, and also because of the impression that any exclusion of the colon resulted in loss of weight. The writer, with Dr. Lyon, has shown that a patient will gain in weight, if on a suitable diet, notwithstanding the fact that the colon has been excluded; also, that the ileum, after a while, takes on the function of the colon, so that all the water is absorbed before it reaches the opening and in the majority of cases the patient has a formed movement from the opening in the ileum.

Indications for Operation.—Multiple polyposis of the bowel; acute hemorrhagic colitis; any malignant disease where a more radical operation is contra-indicated; tuberculosis of the large bowel.

Technique.—The *Battle Incision*, that is, an incision to the right of the rectus muscle, is employed. The peritoneum having been opened, it is easy enough to locate the ileum as it enters the cecum. It is well to make the ileostomy as close to the cecum as possible, so that if irrigation of the large bowel should be necessary a catheter can be passed through the ileocecal valve without difficulty. The ileum is now held up by the assistant, and a bloodless space selected in the mesentery. This having been found, an incision is made through it and a glass rod run through the opening. The peritoneum is now closed, a few sutures being taken on each side so as to secure the peritoneum to the bowel. The fascia is next closed with interrupted sutures, and afterward the skin in the usual manner. A small swab is placed between the glass rod and the skin to prevent abrasion of the latter. Unless very urgent, the bowels should not be opened for three days; by this time the wound is fairly well sealed off, and there is very little danger of infection. If, for any reason, it is necessary to open the bowel at the time of operation, this can be done with little risk by inserting Paul's tube, to which a drainage

tube is attached. This is accomplished in the following manner:
A longitudinal slit is made in the anterior border of the bowel,
with a purse-string suture placed around this opening; one end
of the Paul tube is now inserted in the opening, and the purse-
string suture closed, thus preventing any leakage. At the end
of three or four days, the Paul tube comes away, and the opening
in the bowel can be enlarged if necessary.

Fig. 150
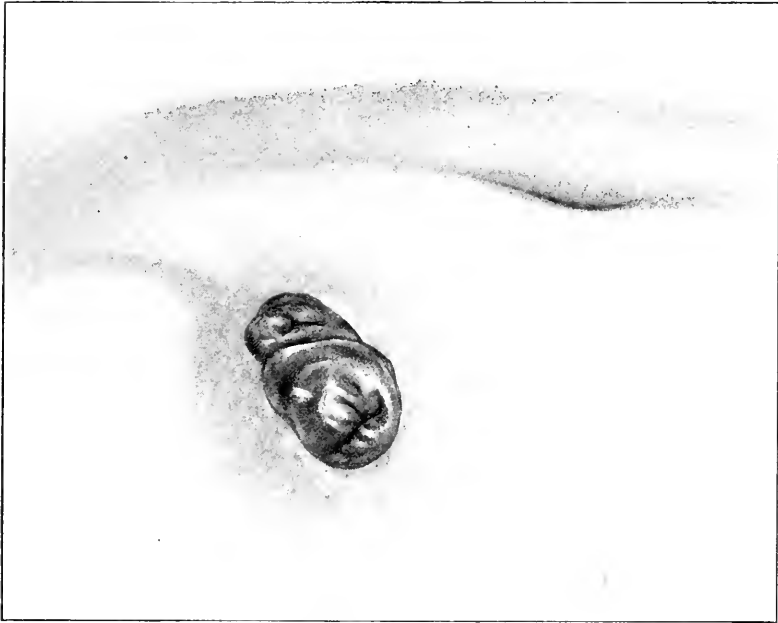
Ileostomy. (Lynch.)

We have sometimes found it advisable, in connection with an
ileostomy, to do also an appendicostomy. This can very easily
be accomplished at the time of operation by bringing the appendix
through a stab wound in the abdomen close to the opening in the
ileum. This method has the advantage of allowing a very small
catheter to be passed into the cecum for the purpose of irrigating
the large intestine without any danger of regurgitation of the
fluid into the small bowel. With an ileostomy there is some
trouble in irrigating the large bowel through the ileocecal valve,

because of the fact that the valve becomes patent and there is a return of the water into the small intestine.

Another method which can be followed is that of sewing the ileum to the cecum, bringing out the ileum and cecum so that when they are outside the abdomen they have a double-barrelled gun effect, which can be easily closed by passing a clamp and dividing the septum between these two parts (see Fig. 175). This operation is somewhat similar to the three-step operation of Tuttle for the removal of sigmoidal growths.

CHAPTER XXVI.

APPENDICOSTOMY.

WE are indebted to Dr. Robert Weir, of New York, for having pointed out a new and accessible route by means of which we are able to irrigate the whole of the large and part of the small intestine, and thus control a large tract of mucous membrane that is subject to infection, ulceration, and new growths without subjecting the patient to the risk and inconvenience that attend a cecostomy or colostomy.

Indications.—It is now several years since Weir's article on appendicostomy first appeared. In the meantime, observation and a wider experience have enabled us to perfect the technique and arrive at a definite conclusion as to the value of the operation as a surgical procedure in the following conditions:

1. As a means of artificial feeding.

2. In cases of ulceration of the large intestine.

3. In amebic dysentery, with the object of reaching the source of the trouble by means of irrigation.

4. To prevent distention of the large intestine following operation.

5. To drain the intestine in case of obstruction of the large intestine.

6. To relieve mucous colitis due to reflex appendiceal conditions.

7. As a substitute for cecal colostomy.

8. As a means of irrigating the small intestine.

The Modern Operation.—The patient having been prepared as previously suggested (see Chapter II), the location of the appendix is ascertained, if possible. In some cases the appendix is found directly down over the brim of the pelvis and can sometimes be felt through the rectum. In such cases the incision should be made low down in the abdomen; otherwise, the

McBurney or Kammerer incision is employed.   The length of
the incision should not exceed an inch and a half.

When the abdomen is opened the cecum can easily be found,
and by following the anterior band the appendix is reached and
brought forth and the appendiceal artery ligated close to the

Fig. 151
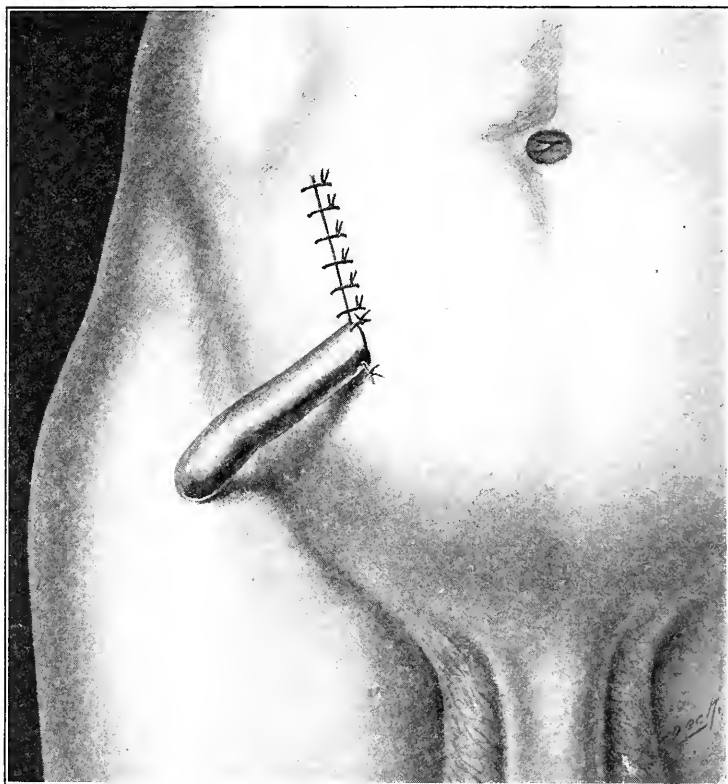
Appendicostomy before appendix has been removed.   (Lynch.)

first branch that is given off to the appendix.   It is important
to observe these precautions, as this branch anastomoses with
the appendiceal branch of the cecal artery and furnishes a good
blood supply to the root of the appendix.   The meso-appendix is
now stripped off, and any bleeding-points presenting themselves
are ligated.   The cecum, about one-tenth of an inch from the

appendix, is next sutured to the peritoneum. This precaution is observed so that if, by any chance, the appendix is perforated in an effort to introduce the catheter afterward, the perforation will be extraperitoneal. The fascia is now closed by means of interrupted sutures, care being taken not to suture it too snugly

Fig. 152

Appendicostomy after the appendix has been removed. Catheter *in situ*. (Lynch.)

around the appendix; otherwise, strangulation may occur at this point and complications follow. The appendix should then be held by an assistant and sutured to the skin by means of two lateral sutures to prevent it receding into the abdomen. The skin is approximated on each side of the appendix by means of

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two continuous No. 2 plain catgut sutures, and finally the wound is sealed by means of cotton and collodion; and care must be taken that the collodion does not flow around the appendix and strangulate it.   Afterward the appendix is wrapped in a piece of rubber tissue and a gauze dressing placed over all, held in place by means of adhesive plasters, thus completing the operation.

On the third day subsequent to this stage of the operation the appendix is opened by removing that portion above the level of the skin.   No anesthetic is required for this procedure, which is not painful.   Contrast this with a case in which the mesentery was allowed to remain intact.   Immediately the appendix was handled the patient complained of pain radiating up to his umbilicus and then into the epigastrium, increasing in intensity; and, as the mesentery was cut and handled the patient became pale and nauseated; a cold perspiration covered his face, and he was returned to bed, suffering from shock.

Normal Salt Solution Through the Catheter.—The solutions to be used for subsequent irrigation depend on the condition for which the appendicostomy is performed.   If it is to be used as a means of artificial feeding, the patient suffering from some gastric trouble, then suitable nourishment is administered.   It is, however, well to know that a fair percentage of fat is absorbed in the cecum, as pointed out by Sir William MacEwen.   This statement may be questioned on account of the absence of villi in the large intestine; but if we remember that Lieberkühn's follicles are really inverted villi we can more readily see how this is possible.   Moreover, we believe it is probable that under certain conditions those inverted villi, which ordinarily absorb a certain percentage of the fats may, by some wise provision of nature, be capable of increasing their capacity.   In one case of Tuttle's, where an artificial anus had to be made on the right side near the ileum for multiple adenomata in a child, by all preconceived and accepted ideas the child should have lost weight, and I believe would have, had it not been for the fact that he was systematically fed on emulsified fats.   Now, one year later, the child has gained about ten pounds and is, so far as we can see, cured of his adenomatous condition.   For this reason we are inclined

to agree with the surgeons who advocate this operation as a means of artificial feeding. Keetley has employed it to relieve obstinate constipation; to fix the cecum in cases of intussusception of the ileum, and as a substitute for colostomy. We have had no experience with the operation for the conditions named by Keetley.

We do speak authoritatively, however, of its value in amebic dysentery, as the majority of cases where we have employed this procedure were for the relief of this condition. As each and every papular ulcer that we see in the intestine contains one or more amebæ, which, when the mucous membrane ulcerates, sets free several young amebæ, these being free in the intestine, penetrate at some other point in the gut forming one or more colonies, thus multiplying and forming fresh foci. For this reason, washing out the intestines and removing the young colonies faster than they are produced will bring about an improvement which, if persisted in, will eventually result in cure. In other words, we believe the cure of the patient by irrigation to be purely a mechanical process. Other men have had equally good results with solutions of quinine, copper, krameria, etc.; but if our statement is correct, then a normal salt solution is sufficient. The disadvantage of using medicated solutions like quinine, copper, and so on, is that they frequently cause very disagreeable toxic symptoms.

The question may be asked, Why should not high colonic irrigations produce the same results? Because, first, the current is *vis a tergo;* second, very few patients readily tolerate taking high rectal injections and will not continue the treatment for any time, for, owing to the sensitiveness of the intestine, spasmodic contraction takes place, causing acute pain. Again, rectal irrigations, simple as they are, require a degree of skill not possessed by all patients. Assuming, however, that patients are willing to put up with the discomfort, and granting that they will carry out the treatment, it is doubtful if in many cases the cecum is reached. In comparatively few cases have amebic ulcers been found higher than the cecum; if the ileum is suspected, it can be reached through the appendiceal opening and washed out, but not by high colonic injections.

Technique of Irrigation.—For the first few days after the appendix has been opened, the bowel is irrigated with a pint of normal saline solution once a day at a temperature of 70° F. Gradually the quantity introduced is increased until a quart is reached; this is the capacity of the majority of individuals. If the case is a severe one, a smaller quantity should be used for fear of overdistention and the possible perforation of an ulcer. It is better in such cases to use a pint at a time and irrigate twice a day. If copper is preferred, a solution of 1 to 5000 is generally used, the patient being carefully watched for toxic symptoms.

Experimental work by Musgrave, in Manila, has demonstrated that the temperature of the solution does not affect the vitality of the ameba; and that the idiosyncrasies of the patient with regard to temperature should be consulted, and his comfort thus increased. Nevertheless, by causing the amebæ to become encapsulated we believe that they are more easily removed, and for this reason, if the patient can stand it, we prefer a cold solution. If an astringent is necessary, then a solution of krameria in the proportion of a tablespoonful to a pint of water answers the purpose.

The postoperative treatment, which is curative, should be most carefully carried out according to the lines above suggested. It should be persisted in for a number of months after the disappearance of the symptoms, because it has been found that by giving a dose of magnesium sulphate after the patient is apparently cured the amebæ may be resuscitated.

In catarrhal conditions a 2 per cent. solution of ichthyol may be given with good results. If it is necessary to use some other solution, the following will be found serviceable: Nitrate of silver, 1 to 5000; solution of hydrogen peroxide 15 to 20 per cent.; aqueous fluidextract of krameria 10 per cent.

In case of multiple adenomata, we have found radium water most efficient. If this cannot be obtained, krameria or some other astringent should be used.

Washing out of the small intestine was first suggested by Keetley and carried into effect by Sir William Bennett and William Ewart (*Lancet*, May 12, 1906, p. 1311). Drs. Ewart and Bennett first worked out the technique on a cadaver, and afterward

successfully put it into effect on a case of Ewart's. Quoting from the report: "Skiagrams were taken later which showed one catheter lying in the ascending colon, and the other in the small intestine passing across from the right side of the small pelvis, across the middle line, till the point was lost about the brim of the true pelvis on the left-hand side." The modus operandi, as described by Ewart, is as follows: "The catheter is bent (not too sharply) to about 110° at a point two and one-half inches from its tip. It is to be introduced not sagittally, as when it is intended for use in the cecum, but inward and down-ward as well as backward, in the direction of the nearest spot on the brim of the pelvis. The assurance that the catheter has entered the small intestine is given by the greater length intro-duced (maximum, in case of Ewart, nine inches), by the subjective sensations of the patient experienced in the hypogastrium even so far as the middle line, by the direct palpation through the abdominal wall sometimes obtained by the operator and by the skiagram of the stilette *in situ*."

Shortly after reading Ewart's paper the writer had several cases of amebic dysentery on each of which he performed an appendicostomy, with the object of irrigating the large bowel. Six of the eight cases thus operated upon promptly yielded to this treatment. Two, however, remained intractable, and on these it was decided to try Ewart's method, especially as the writer remembered that the *entamœba dysenteriœ* sometimes invades the small intestine. The technique of Ewart was not wholly followed, but this is of no importance, except that if difficulty is experienced in passing the catheter as advised by Ewart, my procedure may be helpful. The appendix was gradu-ally dilated and a good-sized urethroscope passed, electrically lighted, into the cecum, and through this instrument was passed a catheter into the small intestine; then the urethroscope was withdrawn allowing the catheter to remain *in situ*, and the in-testines irrigated with a normal salt solution.

Closure of the Appendix; When and How.—In amebic dysentery we are in the habit of allowing the opening to remain for at least a year and a half; in so doing there has not been a single recur-rence in the twenty-seven cases reported by James P. Tuttle and

the writer. In mucous colitis, with or without ulceration, multiple adenomata, and all other conditions for which this operation has been suggested, the opening is closed three months after the subsidence of all symptoms, or the cure of the condition, if done to relieve some mechanical obstruction; if used as a means of artificial feeding, it is closed after it has outlived its usefulness.

Complications.—**Herniæ** occurred in two cases, but as they were small they caused very little inconvenience. When the time came to close the opening, it was decided to exsect the appendix and repair the hernia at the same time. The technique adopted in these cases was as follows: The opening of the appendix was first cauterized with a Paquelin cautery; an incision was made around the appendix and the organ isolated so as to permit its being clamped and its stump burned off. The operation was then proceeded with in the usual manner, the appendix being clamped close to the cecum, cauterized and inverted, and finally buried with Lembert sutures. Primary union and cure of the hernia resulted in both cases.

Pain over the left hypochondriac and splenic regions is a common complication following amebic dysentery. It persists for a considerable time and does not disappear until long after all symptoms of dysentery have subsided. This we believe to be due either to the fact that ulcerations in this region are slow to heal, owing to a mixed infection, or to the accumulation of gas and fecal matter. Pain around the opening of the appendix occurs from time to time, due to little papules of granulation tissue; but this can easily be relieved by removing the cause, using either the curette or nitrate of silver.

Difficulty in Reintroducing the Catheter.—Difficulty is sometimes experienced in reintroducing the catheter owing to a spasmodic closure of the sphincter which guards the opening between the cecum and the appendix. This can be best overcome by gentleness, patience, and possibly the injection of a small quantity of warm olive oil previous to passing the catheter. It is both unnecessary and dangerous to use any force, for the appendix might be perforated and an abscess, or possibly peritonitis, result. If an abscess should follow faulty catheterization it should be promptly opened.

Difficulty in Closing the Opening.—After the appendix has remained open for a year or more, there is sometimes trouble in closing the opening, especially if a large catheter has been used and kept in place for any length of time. This is due to the gradual destruction of the mucous membrane and its replacement by connective tissue, a fecal fistula resulting. Curetting the fistula with an ordinary ear curette and injecting either ichthyol or iodoform mixed with simple cerate, should bring about healthy granulations and gradual closing of the opening. Should this fail the opening can be closed by removing the appendix as previously advised.

Prolapse of the mucous membrane of the appendix occurs in a small percentage of cases. This can easily be remedied by inserting a plug to keep it in place, or by cauterizing the mucous membrane with the actual cautery or with nitrate of silver. Care must be taken, afterward, that stricture does not follow this procedure.

Prolapse of the cecum through the appendicostomy fistula is a rare complication. One case has been reported by Willy Meyer (*Annals of Surgery*, May, 1908, p. 808). If prolapse of the cecum occurs only after the opening is no longer essential, the prolapse can be excised and the bowel sutured, as suggested by him; or the appendix may be removed as in the event of hernia.

Enlargement of the Lymphatic Glands.—One of the complications which I have noticed following this operation (especially where the appendix has been dilated and the mucous membrane traumatized, or where there is some superficial suppuration around the appendix) is *enlargement of the superficial lymphatic glands* above Poupart's ligament. However, this usually subsides in a few days, after appropriate dressings have been applied.

Most watchful supervision is necessary when medicated solutions of high toxicity are used, because (1) a large area of bowel whose principal function is that of absorption is exposed to the solution; (2) because absorption of toxins and drugs occurs more readily from an ulcerated than from a normal mucous surface. Even a solution of salt, if not properly prepared, is apt to work injury to the patient. In this connection we would mention that $\frac{9}{10}$ of 1 per cent. is isotonic with human blood,

and it has been demonstrated by physiological chemists that any deviation from the normal causes a destruction of the blood-cells. The importance of this cannot be overestimated. In one case, owing to the carelessness of the nurse, a concentrated solution from stock was used and caused pronounced shock. We would, therefore, urge those who have not the facilities for preparing the solution, to keep on hand tablets which, when added to a certain quantity of sterile water, give an absolutely reliable solution.

When diarrhea and the passage of blood continue, after all amebæ have disappeared from the stools, examination of the rectum and sigmoid should be made to see whether polypoid growths, either adenomatous or papillomatous exist. They are generally confined to the rectum and sigmoid and can be readily seen through the proctoscope and then removed by means of the snare or cautery.

The danger of liver infection, in case the appendix is involved, has been put forth by Musgrave as an objection to this operation. We admit that the appendix is involved in many cases of amebic dysentery; but we believe the danger of liver infection, following operation, is usually more imaginary than real.

Objections to the Operation.—The danger attending the opening of the abdomen is, of course, the main objection; but there is less danger in the procedure than there is of liver infection if the disease is allowed to run riot. Furthermore, this operation (unless contra-indicated by some complication of kidney, heart or lung) should have no mortality other than that of the anesthetic, if all the rules of surgical technique are carefully observed.

CHAPTER XXVII.

BENIGN TUMORS.

BENIGN tumors are new growths whose cells are arranged in the same systematic order as the tissues from which they are derived, with no special function, and with a tendency to grow away from the parent tissue.

Different types of these tumors are found in the rectum and sigmoid according to the tissue from which they are derived. Some are very rare, others comparatively frequent. All tumors are potential cancers, and as it is difficult to state how long the cell composing a benign tumor will refrain from anarchy in growth, their prompt removal when discovered is the surest means of avoiding future trouble. Besides, no matter how innocent a tumor is when situated in the gastro-intestinal tract, it is a constant source of danger to its host by causing intestinal obstruction, intussusception, volvulus, obstruction to the circulation of the bowel, disturbance of nutrition, diarrhea, or constipation.

Adenoma.—The most frequent of these so-called innocent tumors or polypoid growths is the glandular type or adenoma. In young children they are apt to be found singly, but in a large percentage of cases they are multiple; in fact, the writer is of the opinion that they are more often multiple than single. Some writers try to distinguish between the tumors found in children and those that are found in older people. We believe that such a distinction is more imaginary than real. It must be admitted that children have less glandular tissue in their mucous membrane than older people; consequently there is less glandular tissue and more connective tissue in the polypus of a child then is found in an adult, and this is the only histological distinction that really exists. It is difficult to agree with those authors who say that polypoid growths in children are composed of mucoid or colloid material.

Any tumor of this type is apt to undergo myxomatous or colloid degeneration, but the tumors that we have examined in young children have been composed of glandular and connective-tissue elements, and have differed from other tumors of this type (whether multiple or single) only in having less glandular tissue. Experience has shown that tumors are less likely to undergo carcinomatous degeneration in the young than in people of more advanced age, as there is less irritation to the tumor in the intestine of a child than in the intestine of an adult, and for this reason, also, they are not apt to be so numerous as in the intestine of a grown-up person.

FIG. 153

Single adenoma.   (Lynch.)

In conclusion, the evidence so far collected does not justify any histological distinction between a polypus in the young and in the adult, or between multiple and sessile adenomata. They spring from the same tissue and have the same structure, *i. e.*, glandular with connective tissue interspersed. All evils are worse when multiplied; and so multiple adenomata, whether sessile or pedunculated, are more apt to undergo carcinomatous degeneration than if they are limited, especially if the few are pedunculated. On the other hand, sessile polypi offer more resistance to the fecal matter than the pedunculated, and are more subject to traumatism; consequently, they are more likely to undergo carcinomatous degeneration. Besides, as Doering has pointed out, the histological structure of carcinoma arising from polypoid formation presents the character of an adenocarcinoma.

The writer has collected 41 cases that have undergone carcinomatous degeneration, and finds the following: Pendunculated, 10; sessile 2; pedunculated and sessile, 10; not classified, 19.

From this we can see that while pedunculated polypi do not undergo carcinomatous degeneration as often as the sessile, the proportion is about what one would expect.

Location.—According to Lichtenstein, the relative number of instances of these tumors in the different parts of the intestinal tract is indicated in the following arrangement (the most frequent

FIG. 154
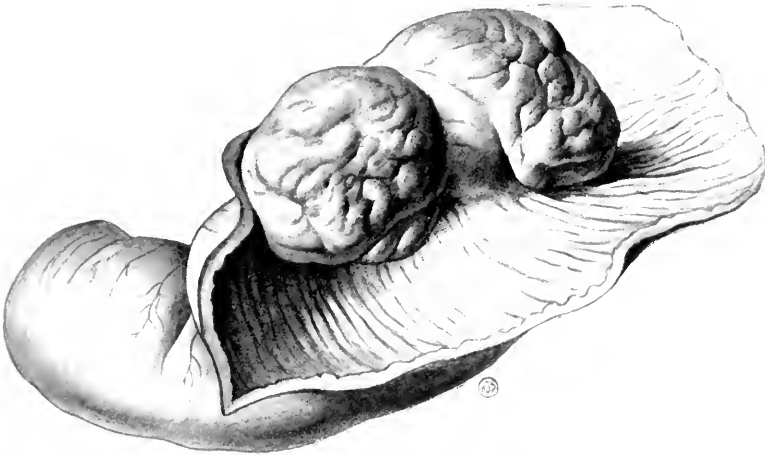
Adenoma of the sigmoid. (Lynch.)

FIG. 155
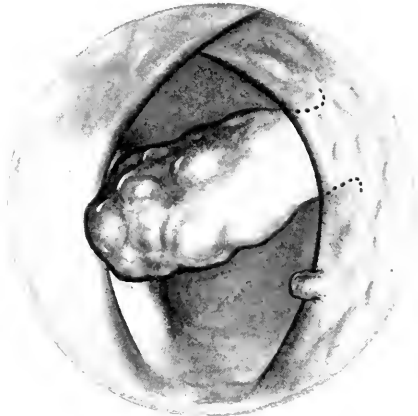
Adenoma of the rectum. (Lynch.)

site of occurrence being in the rectum): Rectum, ileum, colon, ileocecal valve, and duodenum. Malignant degeneration affects the parts named in about the same comparative order of

distribution, with the exception of the ileum; this latter being less exposed to insult by reason of the fluid condition of the feces in this region.

Etiology.—A brief summary of the current theories on the origin of these tumors and their transition into carcinoma may

Fig. 156

Polypus seen through proctoscope.
(Lynch.)

be of interest. Hauser, the chief representative of one view, believes that the polypoid excrescences originate through a primary proliferation of the mucous glands leading to a degeneration of the glandular epithelia, expressed by a loss of physiological function and increased affinity for the stain, differing in no way from cancerous degeneration of the epithelium. The growth is not unlimited, however, and the degeneration is assumed to be likely

Fig. 157
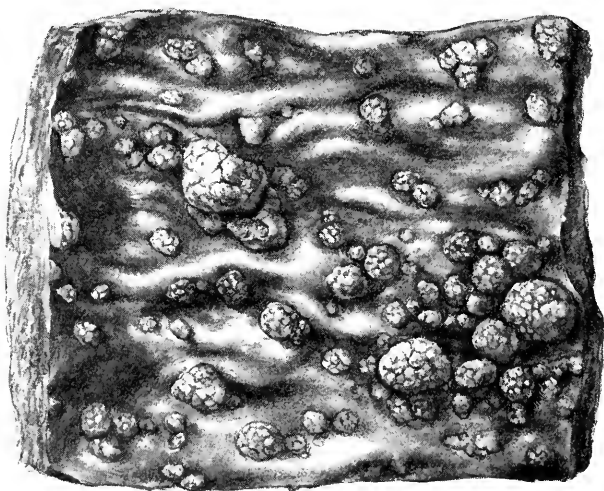
Multiple adenomata of the colon and rectum from a specimen in the possession of Dr. J. M. Lynch.

to occur at a time when the form of the glands is not modified in any way and no changes of any kind are present in the

connective tissue. Meyer believes the early stage of the process should be sought in the connective tissue. He regards the entire process of epithelial change as secondary, and holds that the phenomenon of multiple polypoid formation can be explained only by a congenital tissue malformation of the bowel wall. This is the primary factor and involves the mucosa and submucosa, and the visible epithelial changes should be interpreted as the result of inflammatory stimulus rather than a loss or cessation of physiological function.

Lebert and Schwab likewise regard the connective tissue proliferation as primary, but they believe that this is determined by chronic irritation. In the cases examined by them the glandular tissue was found to participate in no way in the polypoid formation, the process starting directly from a new formation of vessels, for which an inflammatory process causing a permanent irritation of the mucosa is held responsible.

Fig. 158

Single adenoma of the rectum caused by the deposit of Bilharzia hematobia ova. (Natural size.) (Ball.)

Adami says in substance: We now recognize definitely among the blastomas some change in the biological properties of particular cells as an essential for neoplasm proper. We recognize that there must be an inherent and permanent alteration in the properties of the cells that are to constitute the neoplasm. Biologists, however, are coming to see that mutations in animals and plants are not chance occurrences. It must be recognized

that alterations in environment favor frequency of mutation.
All recognize change in cell properties, but, so far, no one has
laid down a rule or principle as to the underlying influence or
stimulus which brings about the change.   From study of the life
history of tumors of differing type, this principle seems to be that
change is consequent upon long continuance in any state in which,
through cell displacement, vegetable activity is possible, while
functional activity is inhibited.   It may be, now, a grade of chronic
inflammation with accompanying arrests of function without
arrest of nutrition, a state which may be of either mechanical or
microbic origin.   At another time, it may be a senescent exhaus-
tion of the functional capacities of the cell that favors the assump-
tion by that cell of vegetation to the exclusion of functional
activities, an assumption accompanied by alteration in the his-
tological character of the cell.   The more we study the life histories
of the different examples of one particular order of tumor (such
as the cancerous) the more it is impressed upon us that there is
no specific causative agent, and that a multiplicity of agents
induces a particular grade of cell reaction.   All these causes may
lead to a modification that is not transient but permanent, and
convey the subsequent cell generation.

From our own investigations we are inclined to think that all
these tumors are of inflammatory origin.   We are not prepared
to formulate any theory as to how these benign tumors later
undergo carcinomatous degeneration.   We are, however, entirely
in accord with Coley, who claims that traumatism is an impor-
tant etiological factor in cancer.   Tumors in the lower bowel
are constantly subject to traumatism and blood extravasation.
Extravasation of blood results in a chemical irritation so that
the blood serum supplies something missing, or affects the
chemistry of the cell so that it becomes immediately active.

Pathology.—In young children the tumors are composed of
connective and glandular tissue.   In older individuals they vary
according to the size and severity of the inflammation from
which they result.

The recently formed tumors are composed of granulation tissue
with numerous small bloodvessels and interstitial fibroblasts.
The entire structure is usually infiltrated by an acute exudate

PLATE VI
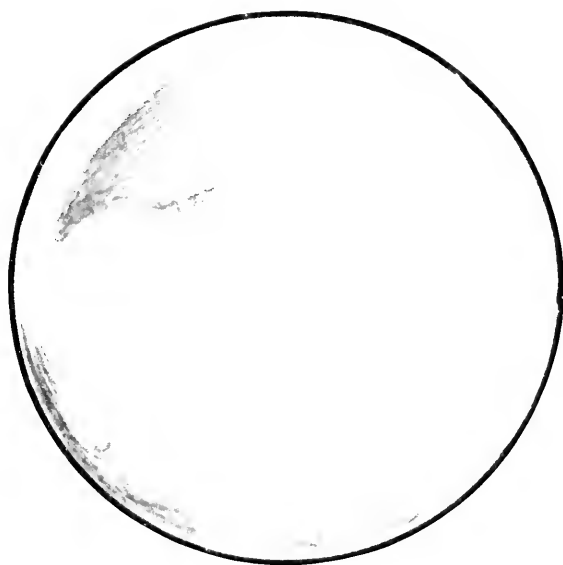
Senile Adenoma near Anus. (Lynch.)

of leukocytes and serum. Showing an acute inflammatory process, usually at the base of the polypus, will be found slightly hypertrophied but rather typical glands. Sections through the large polypus in the same individual show a growth composed of adenomatous glandular proliferation. There is a complete desquamation of superficial epithelium.

Some of the glands in the polyp appear typical, but the greater number will be found very much larger than those of the rectal mucosa, and usually in a condition of hypersecretion. We believe that this goes to show an inflammatory starting-point with a later proliferation of glandular tissue.

Symptoms.—In young children the first symptom that attracts the attention of the mother is the fact that the child is fretful, is constantly straining and crying, and when the child sits on the toilet it seems to strain more and passes mucus and blood. It may suffer from diarrhea, or the first symptom may be a discharge of clotted or fresh blood. Again, the mother may see the tumor passed outside the anus.

It has been our experience that most of the cases are brought to the physician on account of the hemorrhage. In older people, the first symptom may be indigestion with diarrhea, with the passage of blood and mucus. On the other hand, we have seen cases where the earliest symptom was constipation followed by diarrhea. The most important indication is the fact that in all these cases the feces are usually covered with mucus, and the blood either coats the fecal matter or is well mixed with it. The mucous membrane of the bowel is usually streaked with partially digested blood mixed with mucus and feces, and while it is difficult to describe, to one who has seen it, it is always suggestive.

Treatment.—In cases where there are one or a dozen pedunculated polypi, it is a very simple matter to insert the proctoscope and remove them by means of a snare. Plenty of time should be taken, as hemorrhage is likely to result if they are removed too rapidly. The thyrotome should always be at hand in case of hemorrhage, so that the mucous membrane can be picked up by this instrument and the bleeding point seared with it. This is a most effective means for stopping hemorrhage from any cause in the rectum or sigmoid.

The treatment of multiple adenomata has been studied by many surgeons, but so far as we know a definite conclusion has not yet been reached. Some think that matters are made worse by any attempt at removal. The question then arises, Does removal tend to increase the malignancy of these tumors? There are about ten cases in the literature where some of these tumors have been removed and the patient returned afterward with a well-developed cancer not always, however, at the site of the removed tissue. Personally, we are of the opinion that if the tumors are beyond the reach of the proctoscope and healthy mucous membrane cannot be reached, it is worse than useless to attempt to remove any of the growths.

What line of treatment then should be followed?

If the tumors are pedunculated or sessile, and all are accessible, they should be removed by the snare or cautery. If sessile or pedunculated and they do not comply with the rule we have laid down above, some form of local treatment should be adopted.

If the patient's life is threatened by hemorrhage, an artificial anus should be established above the growth, in the hope that by so doing the hemorrhage may cease; and, by the use of astringent irrigation, the tumor may disappear. Afterward, if the tumors have not atrophied or disappeared and the patient is in a. condition to stand an operation, the entire removal of the diseased portion of the bowel should be attempted. Two cases are given here that came under the care of the writer, one illustrating a benign, the other a malignant type:

Case I.—Mrs. L. R., aged thirty-nine years, married and the mother of several children. She was perfectly well up to four years ago, when she had an attack of diarrhea which was ushered in by bearing-down pain in the rectum with an intense desire to move the bowels; she would sit on the toilet for long periods, straining, but without getting much relief. At times the desire to move the bowels became so imperative that she would not have time to reach the toilet and would soil her clothing. At first the movements were fairly good, but were mixed with blood and mucus. Later she passed large quantities of blood mixed with mucus, which condition lasted for about a month and then gradually abated. The bowels have been irregular ever

since. At times she is comfortable, but occasionally suffers acute exacerbations.

She went along in this way for two years before seeking medical aid, and was then treated by different physicians, who did not examine her, but used drugs with indifferent success.

A year ago she was examined at one of the hospitals in New York and was told she had tumors; an operation was advised, to which she consented. In November, 1908, several tumors were removed by cautery, but she suffered such intense pain after the operation that she did not return for further treatment, considering herself benefited by the operation, but dreading repetition of the pain. In February, 1910, she came to the clinic at St. Bartholomew's. She had then lost considerable weight, was very anemic and poorly nourished.

The rectum and lower sigmoid were found studded with polypoid sessile growths varying in size from that of a grape seed to that of a cherry. The examination also disclosed numerous ulcers of the mucous membrane, their size varying from that of a pinhead to half an inch in diameter. The remainder of the membrane was granular, bled easily, and was covered with mucus, blood, and pus. The upper portion of the sigmoid was fairly healthy.

The treatment advised consisted of an enema of cold normal salt solution morning and evening, with an occasional additional injection of a 25 per cent. solution of aqueous fluid extract of krameria.

She was kept under observation, and still visited the clinic twice each week. Improvement was so marked after the first treatment, which occasioned the patient so little inconvenience, that she had gladly followed the prescribed course and was regular in reporting. The improvement has been steady until, at the present time, all ulcerations have disappeared and the growths have been gradually observed until but one remains.

Several polypi were removed for pathological examination, the results of which have been given in the condensed pathological report of these cases.

CASE II.—Miss S., aged thirty-five years; dressmaker. Father died of some bowel trouble. Elder sister suffers from diarrhea,

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with passages of blood and mucus, and was examined at one of the hospitals and told that she had a polypoid growth of the rectum. The patient related a history of chronic constipation from childhood, but had been fairly healthy up to about five months before we saw her. At that time she began to suffer from severe attacks of diarrhea with passages of blood and mucus, these attacks continuing up to the time that we were consulted. Until a month prior to that time she absolutely refused to be treated by a physician, but her family finally persuaded her to seek medical aid. She then consulted her family physician, Dr. White, who advised immediate removal to the hospital, which she resolutely refused. Four weeks later she consented to enter the Polyclinic, and my services were asked by Dr. White. When I first saw her she was so emaciated that it seemed improbable that she could live more than a few days.

Proctoscopic examination showed that the rectum and sigmoid were studded with growths of all sizes and the mucous membrane ulcerated and covered with bloody pus.

Astringent injections were ordered at first, but they could be given only with difficulty and were retained but a short time. The leaky condition of the bowels was such that partial movements constantly occurred at intervals of five or ten minutes, and the patient was necessarily on a bed-pan all the time. I suggested operation for an artificial anus above the growth as the only hope of saving her life. At the same time, I told her family that her chances of surviving the operation were doubtful; but it was nevertheless agreed by relatives as the only possible chance.

An incision was made to the left of the rectus muscle above the umbilicus and the bowel rapidly explored. Palpation established the fact that the sigmoid and a portion of the descending colon were filled with growths. As we had to suspend operation twice in order to revive the patient, further exploration was not deemed wise. We therefore brought out a portion of the transverse colon and quickly closed the wound; the entire operation lasting only ten minutes, including the time required for resuscitation.

The bowel was opened forty-eight hours after the operation, and from that time on the patient was artificially fed by passing a tube through the transverse colon, as she refused nourishment

per os. She seemed to improve for a week or ten days, but gradually sank and died in about three weeks.

It is interesting to note that the wound healed by primary union and no complications followed the operation. The patient died of inanition. An autopsy was earnestly sought, but her relatives refused. I am confident that this is one of those cases where tumors high up in the sigmoid had undergone carcinomatous degeneration. It is unfortunate that autopsy was refused.

The history in both cases points to an acute infection, and later the formation of these adenomatous tumors. I have previously reported two cases that underwent carcinomatous degeneration.

The writer was able to follow a case of Tuttle's, through his association with the latter surgeon. An artificial anus had been made and the bowel subsequently washed out with astringent solutions. There were most gratifying results.[1] Another case, reported by Dr. J. Elliott,[2] practically recovered, following astringent irrigations. The following solutions have been found useful by the writer: normal saline at a temperature of 40° F., hammamelis, 6 ounces to a pint of water, tannic acid 1 to 50; aqueous fluid extract of krameria $33\frac{1}{3}$ per cent. in water.

All these solutions should be used with internal medication, such as salicylate of bismuth, gr. 5, t. i. d.; tincture of deodorized opium, dose depending on the age of the patient. One case has been cured by the performance of an ileostomy and putting the bowel at rest.

Villous Tumors.—There is no pathological or histological basis for distinguishing between this tumor and the ordinary adenoma except that it differs from the latter in size and shape. We may say, therefore, that there is a distinction without a difference between adenoma, and the so-called villous tumor. Two cases have recently come under the observation of the writer. One tumor started above the internal sphincter, involving the posterior wall of the bowel to a height of three and a half inches; notwithstanding this very broad base, the tumor prolapsed constantly whenever the bowels moved. (Fig. 159 is a photograph of this tumor.) It was removed under local

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[1] Transactions American Pathological Society, 1909, p. 141.
[2] New Zealand Medical Journal, 1905, p. 322.

anesthesia. The other case occurred in the practice of Dr. Tuttle three or four days after the writer's case, and he had the privilege of helping Dr. Tuttle with the removal of this tumor. It had a very broad base, was situated in the sigmoid but pro-lapsed when the bowels moved, and looked like a bunch of grapes.

Fig. 159
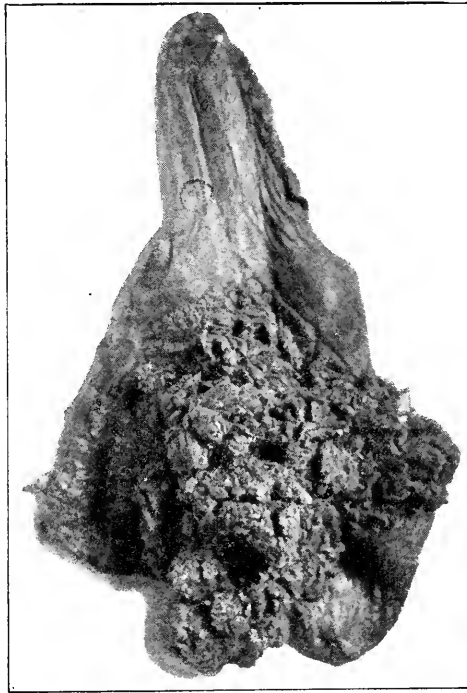
Villous tumor. (Lynch.)

Pathology.—This tumor is composed of glandular tissue with connective tissue stalks, and is distinguished from adenoma by these stalks of glandular tissue which project from the body of the tumor and resemble villi. Except for the conformation of the tumor, there is no difference between this and simple adenoma. On the basis of malignancy a distinction has been made between villous tumor and adenoma; but there seems to be no justification for such a distinction. These tumors are more likely to occur than the single adenoma on account of the extensive involvement

of the mucous membrane. They are also more likely to undergo carcinomatous degeneration on account of the broad base and the extent of surface which is constantly subject to irritation.

Symptoms.— It seems rational to believe that this tumor must be preceded by infection and ulceration of the bowel or some inflammatory condition. This is probably overlooked after the acute symptoms have subsided; and the passage of blood and mucus or large quantities of mucus without blood is perhaps the first reminder to the patient that something is radically wrong.

Perhaps the next most distressing symptom is tenesmus with or without pain in the back. Pain in the back is bound to occur sooner or later on account of the dragging on the mesentery. The patient has a desire to move the bowels frequently, passing mucus and blood with the fecal matter. After the tumor has existed for some time, it usually finds its way outside the anus, so that every time the patient has a movement of the bowels the tumor prolapses and bleeds a great deal.

Treatment.—Radical removal of the growths at the earliest possible date is the surest method of obviating future trouble. The operation will depend on the location of the tumor. As a general rule, it is situated in the rectum and can be removed by the perineal route. It is not always necessary to remove the entire bowel, but if there is any suspicion of malignancy, it is preferable to perform the radical operation, otherwise, the tumor can be removed by an operation somewhat similar to that suggested by Whitehead. Tying off the pedicle and either cauterizing the stump or applying some caustic is not by any means a safe procedure. This is especially true if the tumor is situated anteriorly, as there is considerable danger of a loop of small intestine becoming incarcerated in the funnel-shaped prolapse of the bowel. Under such circumstances any attempt to tie off the pedicle or clamping, would result disastrously.

After-treatment.—It is well to confine the bowels for the first twenty-four hours after operation, if the pedicle is narrow and the tumor has been tied off. If the Whitehead operation on the perineal route is followed, then the bowel should be confined for five days after the operation. It has been suggested by some that it is not necessary to give opium in order to confine the

bowels, as it is a voluntary act and under the control of the patient.
This is perfectly true in healthy individuals, but it is much better,
in these cases, to administer deodorized tincture of opium, 10
drops three times a day, for two or three days after the operation.
This has many advantages: It lessens pain, obviates shock and
keeps the patient from thinking about his troubles. On the
fifth day, the bowel should be opened by an injection of 8 ounces
of oil, and subsequently castor oil or laxol by mouth. After this,
the bowel should be irrigated every day for a couple of weeks
with a normal salt solution. These patients should be kept
under observation for at least one year after operation, so that if
there is any evidence of recurrence, a radical operation may be
performed.

Myoma.—This growth is rare so far as the intestinal tract is
concerned, and only eighty cases have been reported. In 20 per
cent. of these cases the rectum was involved. Myoma may grow
toward the lumen in the gut, or from the lumen. In the case
reported by Descourdes[1] the tumor developed backward under
the skin in the region of the buttocks and was so large that it
hung down in walking, and caused the patient great inconve-
nience when he sat down. Its large fibrous pedicle was attached
to the upper wall of the rectum; the growth developed in the
muscular coat of the intestines, and he believed it to be of con-
genital origin. Two cases reported by Carlier and V. Vander-
Espt[2] were both in the lumen of the bowel and were pedun-
culated. The first occurred in a child, aged four years, and the
other in a woman, aged twenty-one years.

Symptoms.—The symptoms depend on the location of the
tumor. If peripheral, the first symptom may be that caused by
pressure of the tumor on some nerve, or else pressure on a neighbor-
ing organ, angulation of the bowel, or obstruction. If the tumor
is within the lumen of the gut, probably the first symptom to
attract the patient's attention is a desire to move the bowel
frequently without accomplishing much except the passage of
mucus without blood. When the tumor is situated in the rectum,
the early symptoms are diarrhea, pain in the back, a desire to

[1] Revue de Gyn. et de Chirurgie Abdominale, June, 1910.
[2] Journ. de Med., 1881, vol. lxxii, p. 140.

move the bowels, and the passage of mucus with or without blood. As the tumor becomes larger and the lumen of the gut becomes obstructed, constipation is the most marked symptom.

Treatment.—This consists in removal of the tumor at the earliest possible date. It is a comparatively simple matter when the tumor is peduneulated, as it can be easily removed by means of the snare or the writer's instrument. If peripheral, it is a much more difficult operation. In any case, enucleation of the tumor is the proper procedure.

Fibroma.—These tumors are frequently met with, and when situated low down in the rectum or anus are due probably to hemorrhoids undergoing fibrous degeneration or some inflammatory condition of the loose fibrous tissues. They are usually peduneulated, and prolapse when the bowels move.

Symptoms.—Tenesmus, with a desire to move the bowels, and the passage of considerable quantities of mucus. There is rarely any pain, but these tumors are quite likely to cause a prolapse of the bowel from the constant straining.

Treatment.—If situated in the anus, they can be removed by clamp, cautery, or ligature; if higher up, by the snare.

Papilloma.—These tumors are of frequent occurrence around the anus, and they attain a very large size, almost as large as a cauliflower. Dr. Moffat, of Cape Town, South Africa,[1] reported a very interesting case. Completely encircling the anus was a huge soft papillomatous growth the size of an average head. This was attached to the skin around the anus for about two inches from the mucocutaneous junction. The scrotum was free, and there were large warty growths on the prepuce. The feces passed through the centre of the large mass. The glands in both groins were enlarged. The patient's general condition was good, and there was evidently nothing else wrong with him.

The writer has seen a number of cases where the growth was as large as the average fist. In Fig. 160 can be seen growths of this kind in a little boy of ten. Heat and moisture are the two requisites for the growth of these tumors.

Treatment.—Unless these tumors are thoroughly removed they will invariably recur. When limited, they can sometimes be

[1] Journal of Surgery and Obstetrics, June, 1910.

relieved by applying a wash, such as lotio nigra, and afterward dusting the parts with a mixture of starch and calomel. When they attain a large size they should be removed under local or

Fig. 160

Papilloma of the anus. (Lynch.)

Fig. 161

Papilloma in a female. (Lynch.)

general anesthesia, and the roots destroyed by means of the actual cautery; by following this procedure, we have had very few recurrences. The after-treatment consists in frequently dressing the parts, and in keeping them dry and clean.

Fibromyoma.—These tumors are very rare, but they do spring occasionally from the muscular wall of the bowel. They vary in size and are usually pedunculated. They should be removed by the snare or cautery.

Angioma.—These tumors occur occasionally, and involve the loose skin around the anus, extending some little distance inside. They are usually of congenital origin, and somewhat similar to the so-called birth-mark. They consist of bloodvessels bound together by bands of fibrous tissue. A very interesting case was reported by Adler.[1]

Symptoms.—As this tumor is usually congenital, little notice is taken of its existence by the patient until later on in life, when, owing to obstruction or a bearing-down pain, with a sense of fulness, the patient seeks relief.

Treatment.—Surgical interference is very apt to result disastrously on account of hemorrhage. Gradual destruction of the tumor by electrolysis, or by the methods suggested by Prof. Wyeth, is the proper mode of treatment. Professor Wyeth's method consists of injecting water at a temperature of 110° F. around and into the tumor by a specially devised syringe.

Chondroma.—This is a very rare form of tumor and is composed of cartilaginous and fibrous tissue. Only two cases have so far been reported in the literature, and as one of these was composed of glandular, cartilaginous and fibrous tissue, it could not be considered a pure chondroma.

These tumors are usually found in regions where cartilage is normally present, but they are also found in other parts of the body, and when they do develop, they undergo a central necrosis and sometimes liquefaction. When a tumor of this kind occurs underneath the mucous membrane, it may undergo degeneration and a fistulous tract connect with the mucous membrane. These may occur either in children or adults. When found in the rectum

[1] Transactions of the American Proc. Society, p. 168.

they are probably due to embryonic or developmental rests, and, possibly, to traumatism.

Lipoma.—This is a fatty tumor, and is quite frequently found in the intestinal canal. When found in the rectum, it usually develops from the submucosa, and is occasionally reported as occurring from subperitoneal fat. These tumors are composed of fatty tissue; that is, fat cells lying in the vascular connective

Fig. 162

Lipoma.   (Lynch.)

tissue matrix. This fat is a little paler than fat elsewhere, so that a tumor situated in this tissue is well defined. They are composed of moderately firm rounded masses, sometimes forming a single mass. They may become pedunculated, and in such cases they carry with them the mucous membrane tissue as firm connective tissue. The cartilaginous tissue has been found mixed with fatty tissue, and this occurrence is also explained by the theory of cell rests.

Treatment.—The lipomata which occurred in the writer's practice were very easily removed by enucleation. Fig. 163 represents one case that came under our observation. An incision through the skin allowed an easy enucleation of the tumor. When they are high up in the rectum great care should be exercised in their removal, as a fold of the peritoneum may be caught in the pedicle. There is sometimes considerable difficulty in removing these tumors *in toto*, and they have to be removed piecemeal.

Fig. 163

Lipoma. (Lynch.)

Lymphadenoma.—This type of tumor develops from the lymphoid tissues or solitary nodes which are found in the large intestine. They usually appear as polypoid growths and present the symptoms of polypi; that is, a frequent desire to move the bowels with the passage of mucus and sometimes blood. The treatment consists in radical removal. These tumors should always be examined microscopically, as they may be malignant.

In one case which came under the observation of the writer, a pedunculated growth proved to be a lymphadenoma.

Cystoma.—A cystoma is any tumor that may have undergone cystic degeneration. Single cysts are uncommon. One case that occurred in the practice of the writer broke before it could be removed, so that a pathological examination could not be made. It was probably a thrombosed hemorrhoid that had undergone cystic degeneration. These tumors may be single or multiple. The tumor may be composed of several little cysts or one large one. The microscopic appearance of these tumors is rather typical. They are lined with columnar epithelium and have a stroma of connective tissue. They have a tendency to undergo malignant degeneration.

Fig. 164
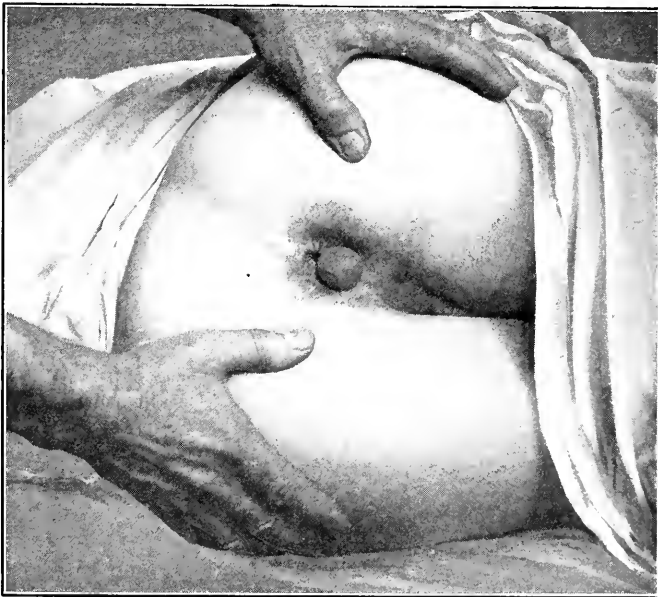
Dermoid cyst.   (Lynch.)

Dermoid Cysts consist of a connective tissue membrane with an epithelial lining, resembling the skin, and containing hair follicles, sebaceous glands, and remnants of bone. They may occasionally contain muscle and nerve tissue. They are usually benign,

although they may undergo malignant degeneration. Fig. 166 represents a dermoid cyst removed by the writer under cocaine anesthesia.

Fig. 165

Dermoid cyst. (Lynch.)

Fig. 166
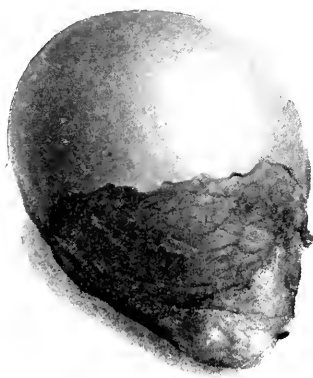
Dermoid cyst. (Lynch.)

Postanal Dimple.—Postanal dimple is an acute dimple-like enfolding of the skin, congenital in origin, probably due to an imperfect approximation of the two lateral halves of the fetus, and is situated at the end of the crease of the buttocks.

It occurs as a funnel-shaped opening, varying in depth from a centimeter to two inches, and is lined with squamous epithelium. It is seen most frequently in hairy people, and, in the majority of cases, is found in males.

Fig. 167
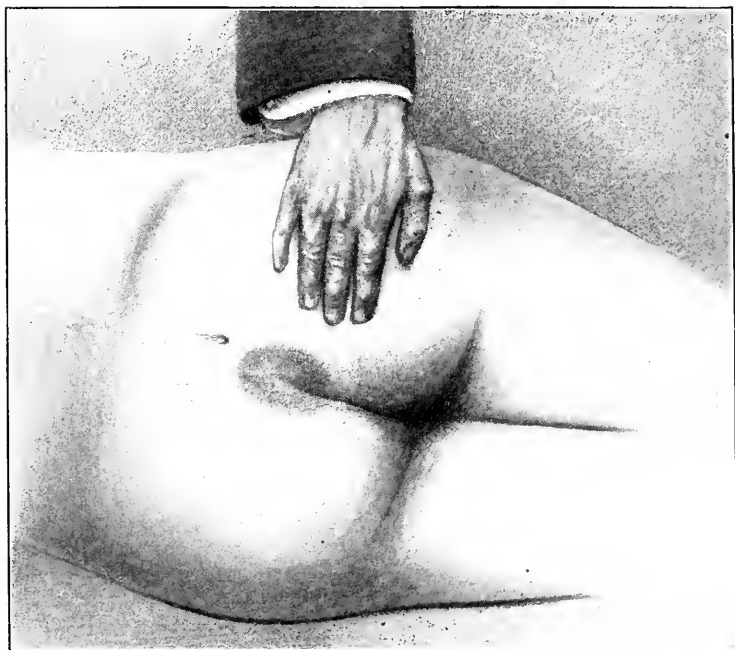
Postanal dimple.   (Lynch.)

Histological description, by Dr. W. L. McFarland, from a specimen removed by the writer:

"Tissue No. X 4235: The orifice or lumen of dimple is $\frac{1}{10}$ of a centimeter in diameter, is lined with stratified squamous epithelium, and appears as normal skin with hair follicles, but no nerve bulbs, sweat, or sebaceous glands. Beneath an epithelial layer is fibrous tissue thickly engorged with masses of exudate products. The portion immediately adjacent to the epithelium is especially

rich in inflammatory cells, leukocytes predominating. Here and there may be observed deposits of a light brown pigment which we presume indicate areas of previous hemorrhage. The tissue directly beneath the epithelial layer, though not markedly vascular, is much more so than the distant tissue. The more distant tissue, in which that of a fibrous nature predominates, exhibits circumscribed areas densely packed with exudative cells, and is very suggestive of approaching abscess formation. Bloodvessels throughout appear to be unchanged, as are also the nerve trunks. The epidermis adjacent to the process above described exhibits acute dermatitis, but to a much less degree than that of the tissue-lining channel."

FIG. 168
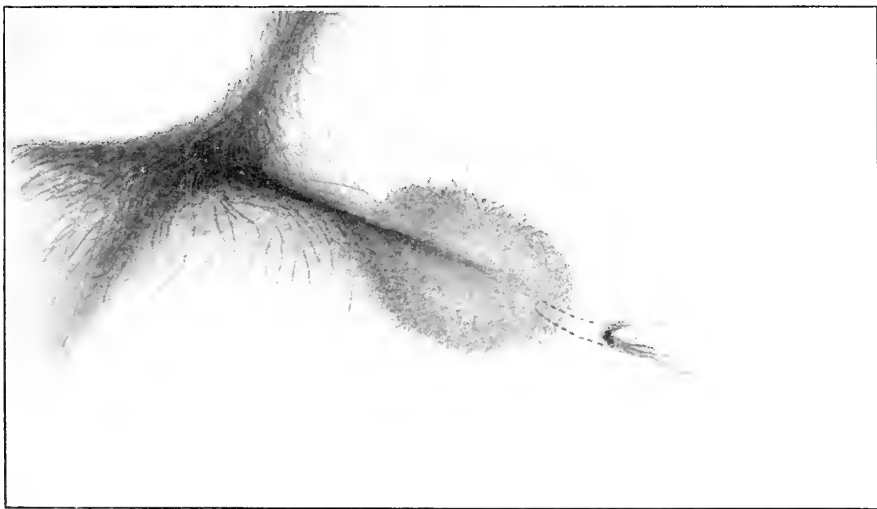
Postanal dimple.   (Lynch.)

This description is typical of a dimple with early infection. As a general rule, postanal dimples (unless discovered by accident during an examination) are not seen by the surgeon until suppuration has resulted, and then are very often mistaken for a true fistula, or a dermoid cyst. One case that came under our observation had been opened six times, only to recur again. As the patient had syphilis he supposed this was part of his disease

and had not worried over its reappearance, assuming that when his syphilis was cured the abscess would disappear also.

Fig. 169
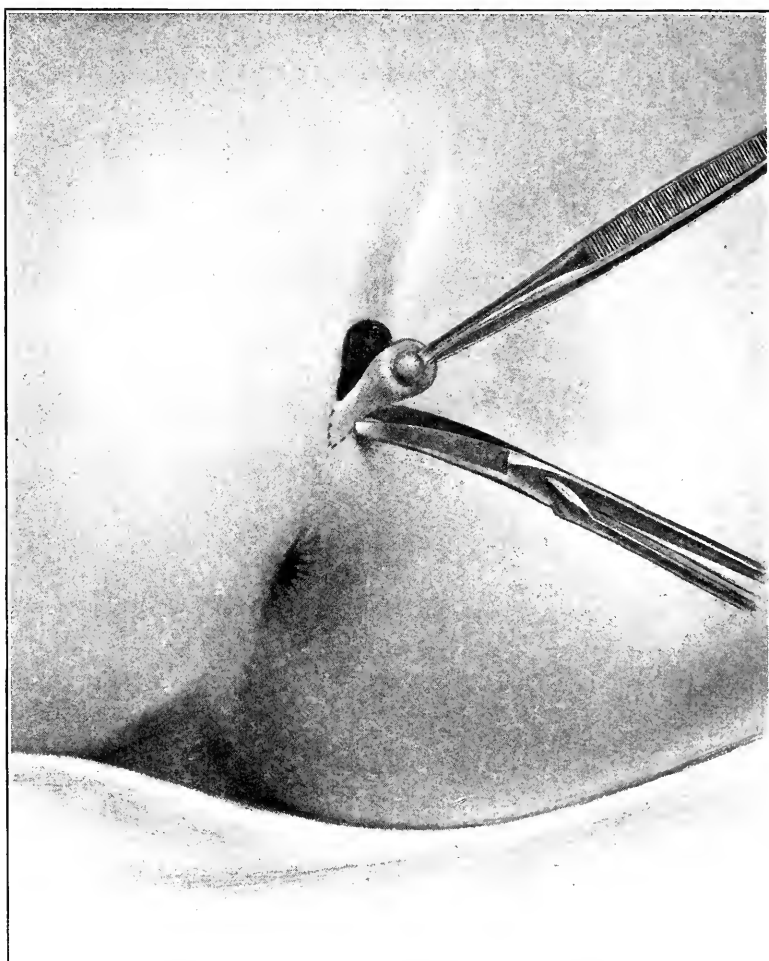
Method of removing postanal dimple. (Lynch.)

A postanal dimple is occasionally diagnosed as a tuberculous fistula because of its persistence. It is not to be wondered at that the uninitiated make such mistakes, as in the minds of most men any chronic process is associated with tuberculosis.

We have spoken of the dimple associated with a fistula being mistaken for a true fistula. It might be well to make this clear. In the majority of cases, when a dimple is observed, it is part and parcel of a fistulous tract, but differing from a fistula in that part of it, at least, is lined with skin, and if not treated by excision, invariably recurs. The following sequence of events occurs in the majority of postanal dimples:

Owing to imperfect cleanliness (especially where the dimple is deep and almost impossible to reach), hairs accumulate, the skin becomes macerated, and infection results. As a result of infection an abscess forms. The abscess breaks, the patient feels better, and he may, or may not, seek advice. If he does not seek advice, the same sequence of events recurs, and a second abscess breaks, probably at some distance from the original abscess; in some cases we have seen five or six different openings. Sometimes the fistula reaches nearly to the anus, and may perforate the rectum.

Treatment.—When seen in the early stage, or before it becomes infected, applications of nitric acid, nitrate of silver, carbolic acid, or the cautery, to destroy the epithelium, will very frequently result in a cure. We seldom, however, have an opportunity to put this treatment to a test, as 95 per cent. of the cases we see are already infected, and we thus have to deal with the malformation, plus infection. Under these circumstances complete excision, with drainage of the wound, is the only satisfactory treatment.

Instruments Used.—The instruments used in this operation are a hypodermic syringe; half a dozen artery forceps; a knife; scissors curved on the flat; and a couple of curved needles threaded with silkworm gut.

Methods and Choice of Methods.—The operation is performed in the following manner: The fistula, having been thoroughly irrigated with formalin and hydrogen peroxide the night before the day of operation, is painted with tincture of iodine. Novocaine or hemesia is the anesthetist's choice. There is no danger, so far as we know, from either of these anesthetics. A little ethyl chloride is sprayed on the skin at a point about half an inch from the dimple. When the point of the skin is thoroughly

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anesthetized by ethyl chloride, the needle is introduced and 5 or 10 minims of the anesthetic pressed into the spot before the chloride anesthesia has entirely waned.

This point is important, as the introduction of a local anesthetic sometimes causes a slight cutting pain, demoralizing the patient, so that subsequent manipulations are difficult.

The skin and deep tissues are thoroughly anesthetized all around at some distance from the infected area, if infection exists. By following this method the infection can be removed *in toto* and subsequent sloughing avoided, the wound healing occasionally by primary union. The parts having been thoroughly anesthetized, an elliptical incision is made around the area to be removed. The skin is then grasped with a mouse-tooth forceps, and the entire dimple, with the complicating fistula or fistulæ, dissected out. A rubber tissue drain is now inserted, and two or three silkworm sutures are passed. These sutures should go through the skin, subcutaneous tissue, and underneath the base of the cavity. Only in this way can perfect approximation and obliteration of the cavity be effected. After this the silkworm sutures are tied over a piece of bismuth gauze. Over all is placed some gauze, which is held in place by adhesive plaster. The dressing should not be removed for twenty-four hours. At the end of this time the gauze is removed and a fresh piece substituted. At the same time the rubber drainage should be removed. If at any time there is evidence of infection the wound can be opened up. The silkworm suture should then be removed, and the wound allowed to heal by granulation.

After-treatment.—The patient should be seen every two or three days until the wound has healed.

CHAPTER XXVIII.

MALIGNANT TUMORS.

Cancer.—From carefully compiled data from many writers and many countries sufficient evidence has been accumulated to convince the most optimistic that cancer is rapidly increasing. Statistics from all over the world go to show that it is now the cause of one death in every nine, and is responsible for a greater mortality than even tuberculosis. Those who try to minimize the truth of this statement by the old argument that our means and facilities for diagnosis have improved so much that the increase is more apparent than actual are deluding themselves and the public. The sooner the medical profession, and the laity as well, realize the fact that cancer is increasing year by year, the sooner will cancer be nipped in the bud by men being on the lookout for it, so that an early resort to surgery may reduce the terrible mortality. Nothing is more important in the medical world today than the prompt recognition of cancer.

These facts as to the increasing prevalence and high mortality of malignant disease are true to an equal or greater extent of the anus, rectum, sigmoid flexure and colon, than elsewhere in the body. All tumors are potential cancers through possible malignant degeneration, but more so when exposed to constant irritation as such growths are from the feces contained in the distal end of the bowel.

Pathologists have found it convenient to divide and subdivide the epithelial and connective tissue varieties of tumors according to the predominance of one tissue cell or another; as, for instance, the adenocarcinoma, where the glandular tissue predominates; colloid, where the tumor has undergone colloidal degeneration, and so on. It does not seem advisable, however, in a book of this kind to go into these numerous subdivisions when there are so many text-books both on this subject and on tumors alone,

which deal in a comprehensive manner with the histological and pathological side of cancer.

For the sake of simplicity, we shall divide malignant tumors occurring in the rectum, sigmoid and colon, into two great classes: carcinoma and sarcoma; and in treating malignant tumors we shall consider the subject of cancer under these two headings.

We might devote several pages to a discussion of the prevalent theories, such as Cohnheim's, the parasitic, and others, as to the cause of cancer, of which nothing definite is known. The most common site of cancer of the alimentary canal is the stomach; next in frequency, and in the order named, come the rectum, the sigmoid, the hepatic flexure, the splenic flexure and the cecum and appendix. Primary tumors of the small intestine are rare. From the foregoing it will be seen that the portions of the tract most subject to trauma (from the fecal current) are those most frequently affected with cancer.

Once cancer is established it either spreads by direct continuity or is carried to other organs by the lymphatic circulation. The inference is that in any organ poorly supplied with lymphatics the growth may remain localized for a long time, which explains why cancer of the sigmoid is less fatal than cancer of the rectum and anus; but it does not follow that the only means of extension is through the lymphatics; the blood-current may also carry the infection. The studies of Ross and McAllister, in regard to the spread and aggravation of the disease through the agency of a chromatin-like substance which is extruded by the cancer cells, are interesting and perhaps of value.

Mortality statistics reviewed by McGlinn show that, while there was a general decrease in mortality from all causes of 1.8 per 1,000 population during the period between 1890 and 1900, cancer not only did not decrease but showed an actual increase of 12 per 100,000 population during this period. It is frequently stated that this increase is only apparent and not real, being due to more accurate diagnosis and better registration reports. However, a study of these figures shows that this increase is almost universal, and that the disease shows a proportionate increase in those parts of the body which are readily accessible, and in which the diagnosis, on account of its ease, has always

been fairly accurate. In the registration areas of the United
States in 1906, out of a total death rate for males of all ages of
358,286 there were 11,166 who died of cancer, and out of a total

Fig. 170
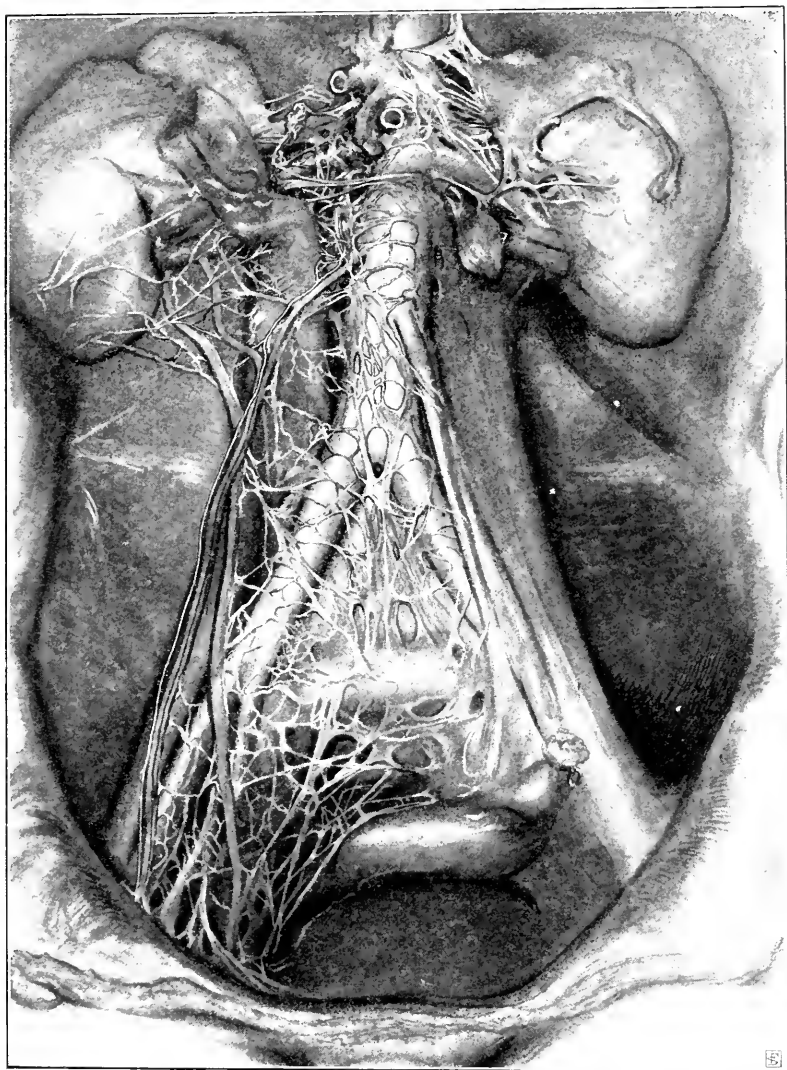
Dissection of the sympathetic nervous system. Drawn under the supervision
of Prof. Stockard and his assistants at Cornell University. (Lynch.)

of 299,819 for females, 17,854 died of cancer, thus showing that one male out of 32 died of cancer, and one female out of 11.2 died of cancer; the corresponding phthisis rates being, for males, one out of 9.9, and for females one out of 10.2. This shows that almost as many women die of cancer as of phthisis.

Fig. 171
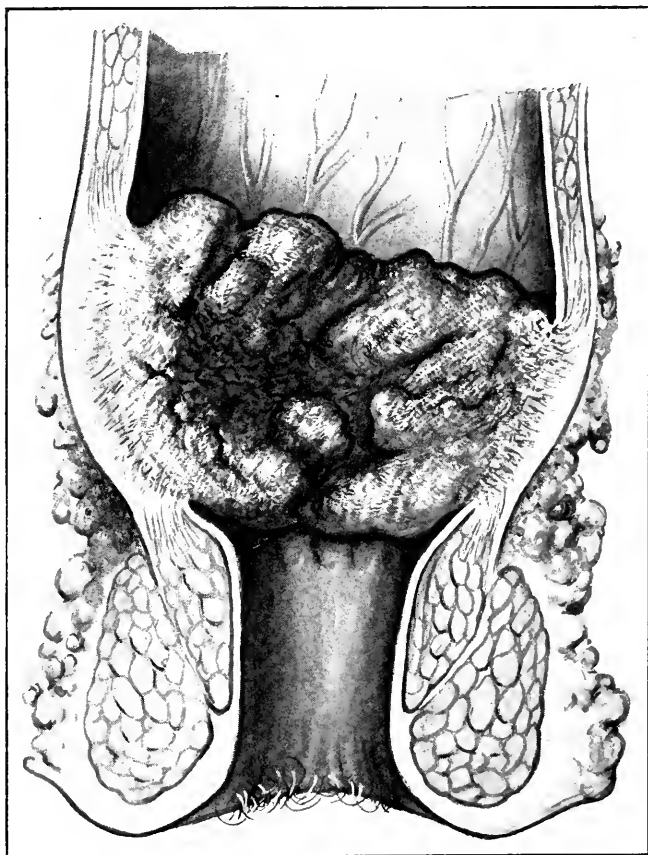
Carcinoma of the rectum. (Lynch.)

In the same area, for 1906, out of a total death rate of 186,944 for males over thirty-five years of age, 10,644 died of cancer; and out of a total of 156,465 for females over thirty-five years of age, 16,879 died of cancer. This means that one man in 17.5

PLATE VII
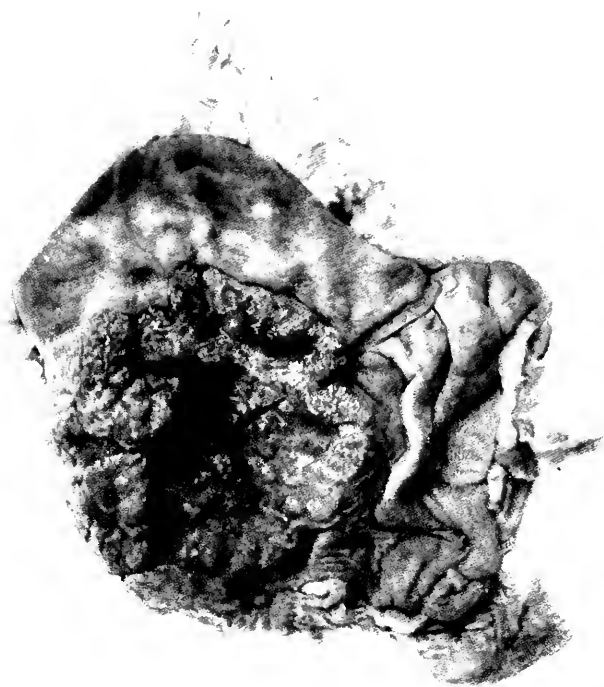
Adenocarcinoma of the Rectum. (Lynch.)

over thirty-five years of age will die of cancer, and one woman in 9.2 over thirty-five years of age will die of cancer; the corresponding phthisis rates for this period being, for males, 1 in 9.9, and for females, 1 in 14.1. In other words, more women past the age of thirty-five die of cancer than of pulmonary tuberculosis. The stomach is the most frequent site of the disease in man, occurring in 43.06 per cent. of all cases. In women the stomach is second in point of frequency, occurring in 24.47 per cent. of cases, while the uterus is first, being the site in 27.68 per cent. of all cases.

Statistics show that more women die of cancer than men; but, eliminating cancer of the reproductive organs, actually more men die from this disease. The age of greatest frequency, in reference to the site of cancer, is shown as follows:

Abdomen, males 60 to 64, females over 50; bladder, males 60 to 70, females 50 to 60; brain, equally over 20 for both males and females (the number of cases is so small that statistics are valueless); breast, males 60 to 75, females 60 to 64; head, face and neck, males and females equally over 75; kidneys, males 45 to 49 and over 75, females 55 to 59; larynx, males 60 to 70, females very rare; liver, males 60 to 70, females 55 to 65; lower extremity, males and females equally after 40; lungs, males 50 to 54, females 50 to 65; mouth, tongue and throat, males 55 to 59, females 65 to 69; ovaries, 45 to 60; penis, after 40; rectum, males after 55, females 55 to 59; stomach, males 55 to 69, females 60 to 64; testicles after 20; upper extremity, males after 20, females after 40; uterus, 45 to 49.

From the statistics quoted by Whitney it would appear that cancer has really increased in Massachusetts. The rate has rather more than doubled from 1850 to 1875, and almost again doubled from 1875 to 1900. This is true whether the rate for persons of all ages, or for persons over thirty years of age, is considered. If the separate sexes and the different decennia of life are compared, there is rather more irregularity, but in the main these also give the same result. If the same rate of increase should occur in the future, it is easy to calculate that in 1950 there will be 6000 deaths to every million persons living over thirty years of age, against the 1600 deaths in 1900. In 1850 the cancer death rate for all

persons over thirty was 375 'for each million living; while in 1900 it was 1578; difference, 1203.

Orth compares the reports of the Pathological Institute at Berlin for the years 1875 to 1908; they show that the number of cadavers in which cancer is found has steadily increased from 0.9 per cent. in 1875 to 14 and 12.2 per cent. in 1906 to 1908. Among the 171 cases of cancer in the last five years there were only two of primary cancer of the liver, that is, 0.28 of all the cancers, while the British figures show fifty times as many. He adds that during the last five years only 12 cases of cancer of the male genitalia were encountered, and only two cases of cancer in the penis, and these in men of sixty-six and seventy-seven years, while there were 149 cases of cancer of the uterus or vagina. Uterine cancer occurred in 38.2 per cent. of all the female cases of cancer, while cancer of the penis occurred in only 0.6 per cent. of the male cases of cancer.

Notwithstanding the fact that the governments of the different countries must realize that the mortality from cancer is as great as that from tuberculosis, very little effort is being made, or very little support given to the investigation of this subject. To be sure, investigation is being carried on by private enterprise, but in Germany alone I believe is there support from the Government. Here we have a State institution with indifferent support.

There are certain well-recognized predisposing causes, namely, the presence of connective tissue and chronic irritation.

Theilhaber ascribes great importance to cicatrical tissue as a factor in the development and especially in the recurrence of cancer. Trauma and cicatrices disturb the metabolism in the mesodermal elements. Normally, the mesoderm holds them in check, and he suggests that possibly an extract of mesodermal tissue might prove effectual in checking the growth of incipient cancer, or preventing recurrence. He adds that possibly in the attempt to remove all morbid tissue the operative trauma has been made unnecessarily extensive. This incomplete operation evidently left morbid elements, but the organism was able to cope with them. As a logical consequence of his view, he suggests the advisability of means to prevent development of cicatricial tissue and to promote normal conditions in the cervical region,

by artificially inducing hyperemia with applications of heat, electricity, stasis and suction devices, wet cupping; and in the case of uterine carcinoma by hot vaginal douches and ingestion of ovarian substance.

We might add that nearly all scar tissue is not only of low vitality but is tissue that invariably harbors bacteria. In other words, scar tissue is infected tissue. This side of the question has not been taken into account by Theilhaber, but is further evidence in favor of his theory. Febiger[1] has successfully demonstrated the fact that cancer in the white rat is due to a microorganism. It is possible that this microörganism is harbored by scar tissue, but of course it has not yet been shown that there is any similarity between cancer in white rats and cancer in human beings. Nevertheless, we believe that the day is not far distant when the bacteriologists and investigators will be able to say that cancer in human beings is due to a microörganism.

We know from experience that cancer of the stomach nearly always develops on the site of an old ulcer; further, that injury to the skin, due to an x-ray burning, is, in the majority of cases, followed by carcinoma.

During twenty-five years, of 4902 tumors removed by operation in the Kashmir Mission Hospital, Neve found that no less than 1720 were malignant, and of these 1189 were epitheliomatous, and 848 were on the thigh or abdomen and were due to irritation of the kangri, a portable fire basket carried by the people under the clothes. When sitting down this rests against the inner sides of the thighs, or the front of the abdomen. The front of the chest, the breast, and the calves of the leg are exposed to the irritation of the heat, and these regions are also liable to become the seats of epitheliomatous disease, although much less frequently than the thighs and abdomen. The disease is equally common in men and women. The average age of the patients was as high as fifty-five years. Epithelioma is extremely rare under forty; scars from previous burns are often the starting-point for epithelioma; kangri burn cancer is a typical squamous-celled epithelioma. In the early stages the malignancy is slight;

[1] Berl. klin. Wochen., 1913, vol. vi.

it is too slow to infect glands, and is very amenable to operation. In late cases the deep glands are involved, and in many cases, owing to adhesions and brawny infiltration of the skin and cellular tissue, it is inoperable. In many cases its origin is in scar irritation from the constant application of heat. In this respect it is similar to other epitheliomata resulting from mechanical, chemical, or thermal irritation. The nature of the cause is opposed to a parasitic theory of origin and favors a trophic theory of cancer.

The conclusions of de Bovis' review of recent research on this subject are that heredity does play some part in the incidents of cancer, but not to the extent popularly assumed. It is probable that an immunizing process occurs in course of time, which prevents the cancer taint from passing beyond one or two generations. This would explain, he remarks, why succeeding generations of Bashford's cancer mice families do not seem to display any tendency above the average proportion to develop cancer. Research by Tysser, Mayet, Haaland in Norway, and the collective inquiries in Germany and Holland, all confirm the influence of heredity, possibly increasing the chance of cancer by 25 per cent. A point that has not been brought out with sufficient emphasis, he adds, is that the proportion of cancerous parents or grandparents must not be compared with the prevalence in the generation to which they belong. It will thus be seen that the incidents of cancer in the cancer families is unmistakably, though slightly, above the average. The negative conclusions in a collective inquiry in Hungary are evidently due to a lack of authentic family histories among the Hungarian peasants.

Febiger states that 1668 question blanks were sent to medical men throughout Denmark; 144 reported that they were no longer practising, but all the others, with 11 exceptions, filled out the blanks with scrupulous care. Microscopic findings were mentioned in 35 per cent. of all the cases of cancer. Only 620 physicians had cancer patients in their charge on the day selected for the inquiry, April 1, 1908. Dropping a few duplicate cases, the number of known cancers in charge of physicians was 1138, in a population of 2,650,000, that is, 0.43 per cent. of the inhabitants. This proportion is a little larger than is reported elsewhere, but may be due to more precise records. The report of cancer patients

in the cities was somewhat larger than in the rural districts; three times as many uterine cancers being reported in the cities as in rural districts, while gastric cancer was more often observed in women who had children. The fact that 23 of 112 male patients with gastric cancer were alcoholics, and 7 of 16 with cancer of the esophagus, and 4 of 11 with cancer of the liver, suggests alcohol as a causal factor; but there is no history of liquor drinking among the 91 women with gastric cancer (with a single exception), and 11 with cancer of the esophagus and 6 of the liver. The influence of heredity seemed to be apparent in 5 or 6 and possible 7 per cent. of all the cases. The influence of contagion also seems to be indicated in a number of others, the total reaching 14 per cent. in which there was evidence in favor of the assumption of direct transmission of the cancer. This proportion was still higher, between 14 and 20 per cent., for gastro-intestinal cancers. In conclusion Febiger appeals for closer study of the particulars in regard to the anamnesis respecting possible contagion. "The collective inquiry by the Danish Committee," he says, "is the most valuable contribution of the kind presented, as over 99 per cent. of the medical men throughout the country coöperated, and with zealous thoroughness."

Symptoms of Cancer.—The symptoms of cancer of the rectum and colon depend to a certain extent on the kind of tumor, and the site. It is impossible to say definitely which is the earliest and most important symptom, as histories, even when taken with the greatest care, are unreliable, as very few patients are sufficiently observing to be able to say definitely what they first noticed. So far as we know there are no subjective symptoms peculiar to early bowel carcinoma. Most of the symptoms which we shall describe later are only present when the disease is well advanced.

A complete history is as follows: The patient was perfectly well up to a certain time, when some change took place, the exact nature of which it is difficult to describe. This was followed by gradually increasing constipation or diarrhea. Subsequently it was noticed that when the bowels moved, a little blood, clotted or liquid, was passed, usually traced to some local condition, in the majority of cases, piles. Later on the blood was mixed with

mucus and feces. At this period there was an uncomfortable feeling in the pelvis, denoting something wrong, without the patient being able to exactly define it. The desire to move the bowels became more imperative, and the patient went to the toilet several times a day, passing a little mucus, blood, and feces. There was a constant desire to move the bowels, without accomplishing much, except the passage of mucus and blood. The

FIG. 172

Epithelioma of the anus. (Lynch.)

patient began to suffer from dyspepsia, loss of weight and appetite, and was constantly nauseated. Finally he got to the period where he had to move the bowels every hour, and always after getting out of bed in the morning.

The diarrhea at this stage is not in reality a diarrhea but a desire to get rid of blood, mucus and gas, which gravitates down to the anus.

Enumerating the early symptoms of cases seen by the writer, blood occurred in 75; indeed, in some well-developed adenoma-carcinomata it was the only symptom present; but in the

majority of cases it was associated with other symptoms, such as constipation, piles, diarrhea, and the discharge of mucus. Most practitioners associate bleeding with hemorrhoids or some local ulceration, and, while in the majority of cases this is true, it is the duty of every physician and surgeon to investigate carefully the gastro-intestinal tract for other sources, before coming to the conclusion that its origin is anal.

Mucus was the first symptom noticed in 38 cases and is probably the first manifestation in most cases; but it is so frequently associated with minor ailments that its presence rarely causes any anxiety to the ordinary individual. Only a very small percentage of patients who pass mucus ever suffer from malignant disease; yet, when found without other derangement of function, it should stimulate the physician to make a careful examination by every available means. It would be wiser in all such cases to test the feces for occult blood, a strong evidence of malignancy.

TABLE OF FIRST SYMPTOMS.

Blood and other symptoms, without mucus	25 cases
Blood alone	21 "
Protrusion and other symptoms	17 "
Constipation	15 "
Blood and mucus alone	15 "
Blood and mucus and other symptoms	14 "
Diarrhea alone	13 "
Diarrhea and other symptoms, not constipation	13 "
Pain in rectum alone	13 "
Increasing constipation	13 "
Gas and other symptoms	12 "
Pain outside of rectum	11 "
Frequent desire to go to stool	10 "
Constipation and other symptoms	10 "
Gastric disturbances	9 "
Frequent desire and other symptoms	9 "
Pain in rectum and other symptoms	8 "
Bearing down in rectum	6 "
Pain outside of rectum and other symptoms	6 "
Pruritus ani alone	5 "
Large amount of gas alone	5 "
Acute obstruction alone	5 "
Unfinished stool alone	5 "
Alternate diarrhea and constipation alone	4 "
Imperative desire alone	3 "
Alternate constipation and diarrhea and other symptoms	3 "
Increased constipation and other symptoms, not diarrhea	3 "
Loss of weight alone	3 "
Indescribable feeling alone	2 "
Acute obstruction and other symptoms	1 "
Imperative desire and other symptoms	1 "
Weakness in lower abdomen and dragging	1 "
Increasing diarrhea alone	1 "
Increasing diarrhea and other symptoms	1 "
Increasing diarrhea and night diarrhea	1 "

In rectum alone	13 cases
Undescribed	8 "
Throbbing	2 "
Burning	1 "
Bearing down	1 "
Griping	1 "
In rectum, with other symptoms	8 "
Undescribed character	5 "
Aching	1 "
Throbbing	1 "
Griping	1 "
Pain alone elsewhere	7 "
Back, not characterized	2 "
Back, numb ache	1 "
Left side of abdomen, uncharacterized	1 "
In bowel, not characterized	2 "
Griping in bowel	1 "

Constipation, progressive or sudden, was noted in 65 cases. Like mucous discharge, it is so common that it is passed over lightly by most patients and physicians, unless severe, or associated with other symptoms.

Primary Sarcoma of the Large Intestine.—Primary sarcoma of the large intestine is rare. When it does occur it usually invades the connective tissue around the rectum, or the submucosa, and very seldom results in ulceration of the mucous membrane. In many ways it resembles a perirectal stricture. Indeed, in some instances, it is impossible to distinguish between a sarcoma and a perirectal stricture.

There are several varieties of sarcoma. Among these are the round-cell, the spindle-cell, the alveolar, and melanotic.

The commonest of the primary sarcomas is the round-cell sarcoma. Melanotic sarcomas are usually multiple and found on the serous surfaces; they are ordinarily secondary to sarcoma elsewhere.

Lymphosarcoma commonly starts in the lymph follicles, and later extends beyond the limits of the follicles and invades the mucosa and other portions of the intestine.

Case I.—Patient, aged sixty years; general appearance good. Three months previously he had a small polypus removed from the anterior portion of his rectum just above the sphincter. He was quite well for a time, but had recently suffered from a throbbing pain, and had a discharge of blood from the rectum.

He had a constant desire to move the bowels, when he passed blood and mucus. A local examination revealed a lobular movable growth, involving anteriorly one-third of the circumference of the bowel, which did not feel like a sarcoma. The growth was removed by local incision, and no effort made to bring the edges of the wound together. One year later the patient had a recurrence with a metastatic deposit in the groin and over the abdomen. Died later. Diagnosis: lymphosarcoma.

CASE II.—August 20, 1910. J. F., aged fifty-four years; Austrian; had been in the United States twenty-four years. Tailor by occupation. Five months before, he had been operated on for hemorrhoids. For a month before coming to us he had suffered from gradually increasing constipation, which had become so obstinate that it defied cathartics. His bowels had not moved for seventy-two hours before examination, notwithstanding the fact that he had taken cathartics right along. During this latter period he had suffered severe pain in the rectum, sacral region, and left knee. He had a constant desire to move the bowels, with severe straining (bearing down) when he sat on the toilet, but all he could accomplish was the passage of a little blood and mucus.

Examination, under ether, revealed a pedunculated mass with a broad base attached to the anterior wall of the rectum about one and a half inches above the anal margin. An incision was made around the anus, followed by a resection of some two and a half inches of the rectum, which included the tumor. A drain was inserted posteriorly. He left the hospital ten days after the operation.

August 24, 1910. Tumor examined by Dr. Jeffreys. Tissue found malignant. The appearance favors diagnosis of lymphosarcoma.

Examination of tissue by Dr. John Edgar Welch. Section through the growth from the rectum shows a sarcomatous tumor. The parenchyma cells are very irregular in size, and show a mixed type composed of large and small spindle-cells, round and irregular shaped cells, the greater number of which are of the last variety. Fetal connective tissue is found throughout. The vessels are very numerous and, for the most part, have a well-formed wall. At

the periphery of the tumor there is an ulcerating surface. The entire growth is permeated by an exudate of leukocytes and serum. The cells of the growth show numerous karyokinetic figures which indicate activity of growth. Diagnosis: lymphosarcoma, or round-cell sarcoma.

Fig. 173

Sarcoma. (Lynch.)

September 15, 1910. We made an examination of the patient today, and, except for the presence of some granulation tissue, results are ideal. Patient feels well and attends to business.

Macroscopic appearance of tumor: The new growth is composed of two nodules, the larger 4 cm. in its largest diameter; and the smaller, 2 cm. Both have a grayish white appearance, and are of rather soft consistency (Fig. 173).

Melanosarcoma.—Mrs. D., aged fifty-five years. Family history, negative. Well until three months ago, when she began to have pain in the rectum; this gradually increased, and was worse at night. She had a lump on side of rectum. Pain no worse at stool. Loss of blood at first, none now. Constant protrusion. On right posterior quadrant and extending out on the buttocks one and a half inches and up into the rectum one inch was a black lobulated mass which could be grasped by the fingers and

moved on the tissues below; not painful to touch. Above the tumor the gut seemed perfectly healthy. Specimen taken for examination; pathological report, melanosarcoma.

May 20, 1904. Operation. Perineal excision; wide excision of growth. No attempt was made to preserve sphincter, or to bring the gut down to the anus; the wound was left open.

Mr. S. K., aged forty-six years. Family history was good. Personal history: dark, well-preserved, but tired-looking man. Diarrheal tendency. Hemorrhoids for many years. Present illness began after excessive exercise, seven years ago. Protrusion, pain and bleeding at stool, some swelling, which had disappeared; protrusion was reduced by hand. Large discharge of blood, mucus and pus. External hemorrhoids about the anus; the sphincter was hypertrophied and spasmodic. Large prolapsing hemorrhoids in rectum; ulcerated; on the left side there was a small, hard mass above internal sphincter, very movable and easily dragged down outside the rectum. No induration at base.

February 2. Removed by clamp and cautery. Specimen sent to laboratory. Pathological report, melanosarcoma.

February 25. Parts entirely healed; patient well.

January, 1905. Patient continued to be in good condition.

January, 1906. Lost sight of patient.

Round-cell Sarcoma.—Mr. J. S., aged fifty-nine years. Pale, grayish complexion, strident voice. No cough; always thin. Height, six feet; weight, 135; no recent loss of weight. Operated on ten years ago for polypus of rectum. Constipated, had diarrhea and bleeding, stools flattened, requiring straining with solid stool; passed material resembling flaky shreds; no particular pain. Anus normal. Rectum normal for three inches, at which point was found a round, firm tumor, rather smooth, almost surrounding the gut; mucous membrane slid over it. Caliber of gut reduced about half.

Operation.—Extirpation by boneflap method. Resected four inches; end-to-end union. Very slight hemorrhage. Closed off peritoneal cavity by sutures before opening the gut. Sutured flap in place by silkworm gut. Pathological report, small round-cell sarcoma.

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Spindle-cell Sarcoma.—Mrs. B., aged thirty-four years. Good complexion; moderate weight. Family and personal history, both negative. She had been treated by injection for hemorrhoids for three months. Bowels regular, but had to strain when stools were well formed. Throbbing and aching pain in the rectum, especially at night. No discharge. Just inside the rectum was found a hard, round, nodular tumor, involving two-thirds of the circumference anteriorly; caliber reduced 50 per cent. Mucous membrane moved over it, and it moved on the vaginal wall. Sphincter did not seem involved; it extended up about an inch and a half.

July 10. Removed tumor by perineal dissection; sphincter dissected out and drawn aside; gut dissected up two and a quarter inches; peritoneum pushed up, but not opened; gut brought down and sutured to skin. Pathological report, spindle-cell sarcoma.

Symptoms.—Symptoms in sarcoma will depend to a great extent on the type of sarcoma and its situation, and whether the mucous membrane is involved or not. The first symptom may be pain due to pressure. We have seen an enormous tumor develop with practically few symptoms except pain. Then again obstruction may be the earliest symptom, due to pressure from the outside. In melanosarcoma there may be some bleeding at stool, with discharge of mucus, blood, and pus; a gradually increasing constipation, straining, throbbing and aching pain in the rectum, cachexia, and loss of weight.

Treatment.—Excision is the only treatment that offers any hope.

Diagnosis.—The diagnosis of cancer of the rectum and sigmoid is usually made by digital and proctoscopic examination. If the tumor is low down, a digital exploration is ordinarily sufficient, since one who has ever felt a tumor of this kind cannot possibly mistake it for anything else. As seen through the proctoscope in the early stage, the tumor appears as a little button-like projection into the bowel, while the mucous membrane around the tumor is pale, giving one the impression of fatty degeneration, but being in reality an atrophy of the mucous membrane due to inflammation. At a later stage it becomes a crater-like tumor with an irregular bleeding border, and the mucosa thrown into

folds, and tucked around it, as if nature were making a strenuous effort to set up a barrier against the invasion of the growth. There is sometimes a narrowing of the bowel below the tumor due either to a spasmodic condition or to a true stricture; and some difficulty may be experienced in passing the proctoscope and obtaining a view of the tumor. If such be the case, a mass of debris and blood mixed with the feces can be seen flowing into the tube. There may be no ulceration apparent to account for this condition, but in the presence of stricture and the other symptoms enumerated, a malignant tumor should be suspected. The patient should be given gas immediately and a bi-manual examination made. If this is not sufficient, even the method suggested by Simon, of introducing the whole hand into the anus, may be instituted, provided, of course, the operator does not wear a glove of larger size than $7\frac{1}{4}$ ($9\frac{1}{2}$ inch circumference). The odor of a malignant tumor is usually very characteristic, and is helpful in arriving at a diagnosis.

In some cases it is impossible to make a satisfactory instrumental examination, especially if the tumor is situated in the sigmoid, because the diarrhea is so intense as to constantly obstruct the view, even after the patient has had several enemas to clear the bowels. Under such conditions the bi-manual or manual examinations, just suggested, should be carried out.

It is sometimes very difficult to distinguish between an inflammation and a malignant condition of the rectum; but as a general rule the patient with an inflammatory tumor or stricture does not lose weight, and gives a history of the condition having existed for several years, both of which are unlikely conditions in cases of carcinoma. As a matter of fact, whether benign or malignant, all tumors that may eventually result in intestinal obstruction and the death of the patient demand radical measures for their removal, especially as it is difficult to decide when a benign tumor may take on a malignant aspect. Furthermore, one cannot always be confident that a growth is benign even after submitting a specimen to histological examination and securing such a report, since we have instances of the later removal of the tumor and the demonstration by the pathologist of malignancy of some other portion of it. Therefore, when there is doubt, it is

better to do the radical operation. We hardly ever in our practice submit a specimen beforehand for pathological examination. We believe the practice to be unnecessary and sometimes accountable for catastrophes which occur later. Specimens should be submitted *after* the removal of the growth, *not before*.

Intussusception of the sigmoid, especially in old people, is sometimes mistaken for a malignant condition, but proctoscopic examination should clear up the diagnosis.

Differential Diagnosis.—

CANCER.	INTUSSUSCEPTION.
Loss of weight.	Patient loses very little, if any, weight.
Passage of mucus.	Only occasionally.
The bearing-down pain is constant.	Relieved by enemas.
Pain all over the sacral region.	Localized on either side of the sacrum.

STRICTURE.	CANCER.
History of several years' duration.	Generally a few months.
Patient remains in good health.	Loss of weight.
Odor, very little, if any.	Very marked characteristic odor from discharge.
Structure generally feels smooth and hard to touch.	Thick and nodular.
Dyspepsia and internal discharge are very seldom present.	Dyspepsia and internal discharge.

Cancer in organs adjacent to the bowel may, by metastasis, invade the bowel, or, by invading tissues adjacent to the bowel, press on it from the outside, and, by so doing, cause obstruction. Severe pain, either from metastatic growths, or from cancer in a neighboring organ like the pancreas, may result in paralytic ileus and so simulate obstruction due to a growth in the bowel as to lead one to believe that he is dealing with a primary growth in the bowel *per se*. In such cases, when there is any doubt, a large dose of morphine will relieve the ileus and help in the diagnosis. The diagnosis between secondary and primary carcinoma is not of great importance, because, after all, there is no great risk in opening the abdomen; but it would seem unnecessary to subject the patient with an incurable illness to the pain and inconvenience of an unnecessary operation.

Inflammatory tumors outside the bowel may be mistaken for a sarcoma. This is particularly true when the tumor is apparently adherent to the sacrum. One instance came under observation

of the writer where a foreign body, surrounded by a mass of inflammatory tissue, was diagnosed as sarcoma, and an unfavorable prognosis given to the family. Fortunately an *x*-ray examination revealed the cause of the trouble and cleared up the diagnosis before operation. The foreign body was removed, and the patient made an uneventful recovery.

Benign tumors of the omentum and cysts of the mesentery may, by causing pressure on the bowel, give symptoms of obstruction, or, by causing coprostasis, result in severe diarrhea, which diarrhea, with the presence of a tumor, might lead one to assume that he was dealing with a malignant rather than a benign tumor. Coprostasis, *per se*, with severe diarrhea, may be mistaken for a malignant tumor of the bowel. However, an examination, with a course of lavage, will usually clear up the diagnosis. On the other hand, a severe diarrhea, associated with carcinoma of the bowel, and with slight exophthalmic goitre, can be mistaken for diarrhea associated with goitre, and the fact that the malignant tumor exists may not be observed until obstruction makes it evident.

A malignant tumor should be suspected in all cases of bloody diarrhea if a parasitic or bacterial infection can be eliminated. In carcinoma of the bowel, especially where the tumor is high up, say in the cecum or in the hepatic or splenic flexure, we very often meet with a profuse diarrhea, associated with bloody mucus. In such cases it may be difficult to make a colonoscopic examination because of the constant discharge; but if the patient's bowels are thoroughly irrigated (we are assuming that infection and parasites have been excluded), the mucous membrane will be found healthy. This fact should lead one to suspect malignancy.

Acute or chronic hemorrhagic colitis, associated with a marked loss of weight, may be mistaken for a malignant tumor, especially if associated with spasm of the bowel, but the diagnosis in such cases is easily made, as a proctoscopic examination will show a typical bosselated, inflamed mucous membrane exuding bloody serum and pus.

Riedel's lobe pressing on the ascending colon is not infrequently diagnosed as carcinoma of the colon. It is not by any means an easy matter to distinguish between malignancy and benignancy

in such cases. However, auscultatory percussion may give one a clue to the true nature of the disease.

A hypernephroma of the kidney may be mistaken for a tumor of the colon, but the presence of blood in the urine, and, if necessary, catheterization of each ureter, should be sufficient to differentiate between the two. Hypernephroma usually has a very slow onset, and symptoms are less severe than in cases of carcinoma or sarcoma of the bowel; also the fact that the tumor is at the back of the bowel rather than in front of it and is accompanied by a tympanitic note, should lead one to suspect the kidney rather than the colon. In hypernephroma there is usually pain in the lumbar region, radiating to the abdomen, and perhaps down the thigh. During the passage of a blood-clot through the ureter we get a pain which is characteristic of a foreign body in the ureter. This pain is not influenced by movement, and is usually felt at night, as well as by day. If a varicocele is present, one should be suspicious of a tumor of the kidney.

Hyperplastic Tuberculosis.—It is difficult to distinguish between hyperplastic tuberculosis of the bowel and a malignant tumor. If the tumor is within reach of the finger, or can be seen through the proctoscope or sigmoidoscope, it can be distinguished from a cancer, but when the tumor is not within reach, it is impossible, in the majority of cases, except by an exploratory incision, to tell the difference. Very often large coils of intestine, both large and small, become adherent to the growth, and the wall of the bowel may be enormously thickened, but there is rarely ulceration of the mucous membrane of the bowel, which is of material assistance in settling the question, as, even though we may have a very large tumor, we do not have the usual diarrhea that is associated with carcinoma; but it must always be remembered that there are cases of carcinoma, especially cancer of the sclerotic type, where the only symptom is gradually increasing constipation, and, indeed, the first symptom may be (as very often occurs in hyperplastic tuberculosis) intestinal obstruction.

It is not of great importance that a diagnosis should be made offhand, because in either case an operation is indicated, and a true local hyperplastic tuberculosis, if not too extensive, can be removed without much difficulty.

Actinomycosis of the bowel may be mistaken for a cancer. However, in 60 per cent. of cases, actinomycosis is confined to the neighborhood of the appendix and cecum, and may closely simulate appendicitis. Moreover, it occurs in other parts of the bowel, and, as the disease progresses, ulceration results, so that the only means that we have of distinguishing it from carcinoma is by finding the characteristic sulphur grains of *actinomyces*. Occasionally large pedunculated tumors are formed, and this makes it impossible to distinguish it from carcinoma.

Ulcerative tuberculosis may be mistaken for carcinoma, but as primary tuberculosis of the bowel is exceedingly rare, the presence of a lesion in the lungs will put us on our guard and help to settle the diagnosis between tuberculosis and cancer. If the ulcerations are within reach of the proctoscope or sigmoidoscope they are so characteristic that they are readily recognized.

A typical tuberculous ulcer has irregular, infiltrated, and occasionally undermined edges. The base is uneven, worm-eaten, and necrotic. Small, yellowish, caseous masses are seen, and this picture should serve to distinguish it from carcinoma. A large single sessile or pedunculated polypus may cause symptoms such as dyspepsia or flatulence; and it so closely simulates malignancy as to make it difficult to distinguish between the two. If the tumor is within reach of the finger, proctoscope, or sigmoidoscope it is simple to make a correct diagnosis; but we must remember that quite frequently an adenoma undergoes carcinomatous degeneration, and for this reason it is not always possible to say, except in a large pedunculated tumor, that an adenoma has not degenerated into an adenocarcinoma.

All cells have the function of absorption, secretion, and excretion developed to a greater or lesser extent. As a new growth is more or less parasitic, growing at the expense of the body, apparently with no function, we should be inclined to expect such an aggregation of cells to secrete a substance which would have an injurious effect on the organism. For this reason one would naturally look to the blood changes for an early diagnosis of malignant diseases. So far the examination of the blood has not been very helpful.

Treatment.—The treatment of rectal cancer resolves itself into the radical, or operative, and the palliative, or non-operative methods. We shall consider the former treatment first, because the non-operative is merely palliative and is indicated only in cases that are beyond the skill of the surgeon; in other words, in hopeless cases.

Suitable preparation of the patient for operation has a great deal of influence on the mortality. As there is a certain degree of obstruction in all these cases, the anti-putrefactive diet is theoretically ideal; but such a regimen is usually bulky, hence somewhat obstructive, and, if strictly adhered to, causes a decrease in the appetite. It is, therefore, not entirely practical. One has to consider the idiosyncrasies of the patient and vary the diet, making it as nutritious and concentrated as possible. We have found Schmidt's diet, somewhat modified, to be of great assistance.

Medicinally, for three days before the operation, the patient is given half an ounce of Epsom salts in warm water before breakfast, and ichthyol in five grain doses as an intestinal antiseptic.

Operative Treatment.—Only five operations will be described, which, we are convinced, give the best end-results from the standpoint of good surgery, since they offer the greatest chance to the patient of a radical cure and entail the least suffering. They are as follows: (1) the perineal operation, known as the Quénu-Tuttle operation; (2) the combined operation; (3) the three-step operation; (4) simple resection, when the tumor is situated in the sigmoid; (5) the sacral operation.

The Perineal Operation.—The patient, anesthetized and ready for operation, is placed in the lithotomy position. The rectum is first washed out with a full-strength solution of peroxide of hydrogen, followed by pure alcohol, and then is packed with gauze, or injected with liquid paraffin sufficient to occlude its lumen. An incision is made around the anus, and the mucous membrane is dissected up until the external sphincter is entirely exposed. This muscle is divided anteriorly and posteriorly, the posterior incision being continued as far back as the sacrum along one side of the coccyx. Next an opening is made in the levator ani muscle sufficiently

large to permit the operator to introduce his hand, and this can be done by separating the fibers of the muscle with a pair of scissors and spreading the blades. Through this the hand is passed, and the rectum, mesorectum and fatty tissue with glands are gently peeled from the sacrum. If the mesorectum cannot be peeled off, it is cut close to the bone by means of scissors with a very long handle, curved on the flat, and the cavity is packed with plain sterile gauze. The index finger is next hooked over the levator ani muscle, and with scissors it is separated from the bowel wall. The operator then very carefully dissects the bowel anteriorly from the urethra and prostate after finding the proper line of cleavage. When the peritoneum is reached, it can be peeled off gently and in a great number of cases need not be opened at all. If it has to be opened to bring down the bowel, gauze is immediately packed in to prevent the small intestine from coming into the wound. The rectum is next freed from its lateral supports by placing two clamps on each ligament to prevent bleeding from the middle hemorrhoidal artery, which, if this precaution is not observed, is apt to cause the surgeon a great deal of trouble, and unnecessarily delay the operation.

The lateral ligaments are cut between the forceps, and the rectum should then come down easily. If it fails to do so, the hand is introduced posteriorly and carefully swept around the rectum, separating it from other attachments, till it can be brought down through the anus. The operator should not pull on the bowel or use unnecessary force at any stage lest he tear the mesentery and cause severe hemorrhage. The healthy intestine having been brought outside the anus, the peritoneum is closed by interrupted catgut sutures attached to the anterior wall of the bowel. The peritoneum should not be sewed too snugly around the bowel, nor should a continued suture be used, as either is very apt to be followed by stricture of the intestine. The levator is picked up and sutured to the bowel and the dead space in front is closed with No. 1 chromic catgut sutures. A few interrupted sutures are taken through the muscular layer of the bowel and the tissue inside of the sphincter in order to approximate the sphincter and bowel. The sphincter itself is next sutured, anteriorly and posteriorly, and then the levator ani muscle with its fascia for

about half an inch. The rest is allowed to remain open until after the bowel has been amputated and sutured. A nick is made in the bowel anteriorly, and the mucous membrane carefully examined to see that it is healthy and its blood-supply adequate. The incision is then carried all around the bowel, and the mucous membrane caught with T-forceps, care being taken when the mesentery is reached to see that all bloodvessels are ligated. The mucosa is sutured to the skin, and a drainage tube inserted into the bowel. The remainder of the pelvic diaphragm is now closed, except an opening sufficiently large to admit a drainage tube, around which gauze is lightly packed. A safety-pin is passed through each drainage tube for anchorage, and some fluffed gauze packed around them externally. The patient is put on his side with the legs well extended, and the buttocks strapped with adhesive plaster.

The Combined Operation. — When the carcinoma is situated slightly above, below, or at the peritoneal reflexion, the combined operation is unquestionably the best. If it were not for a high mortality this would be the preferred operation in all cases of cancer of the rectum, but, unfortunately, up to a short time ago this procedure was followed by a very high death rate, especially among men.

The combined method has many advantages over the perineal or sacral operations. It insures a bloodless procedure, and allows the operator to discover if there is any involvement of the liver or lymphatic glands, and to decide definitely whether the patient should be left with an artificial anus or the sigmoid brought down and attached to the skin.

The writer considers the technique developed by himself superior to any yet practised. It is a combination of sacral anesthesia with blocking of the sympathetic at the bifurcation of the aorta, tying off the sigmoidal and superior hemorrhoidal arteries, and making a new peritoneal diaphragm, so that the abdominal wound can be closed before proceeding with the peritoneal portion of the operation.

There are two methods which may be followed: one which we will call A, where the continuity of the bowel is not disturbed, and where, after the tumor is excised, it is sutured to the anus or skin.

PLATE VIII
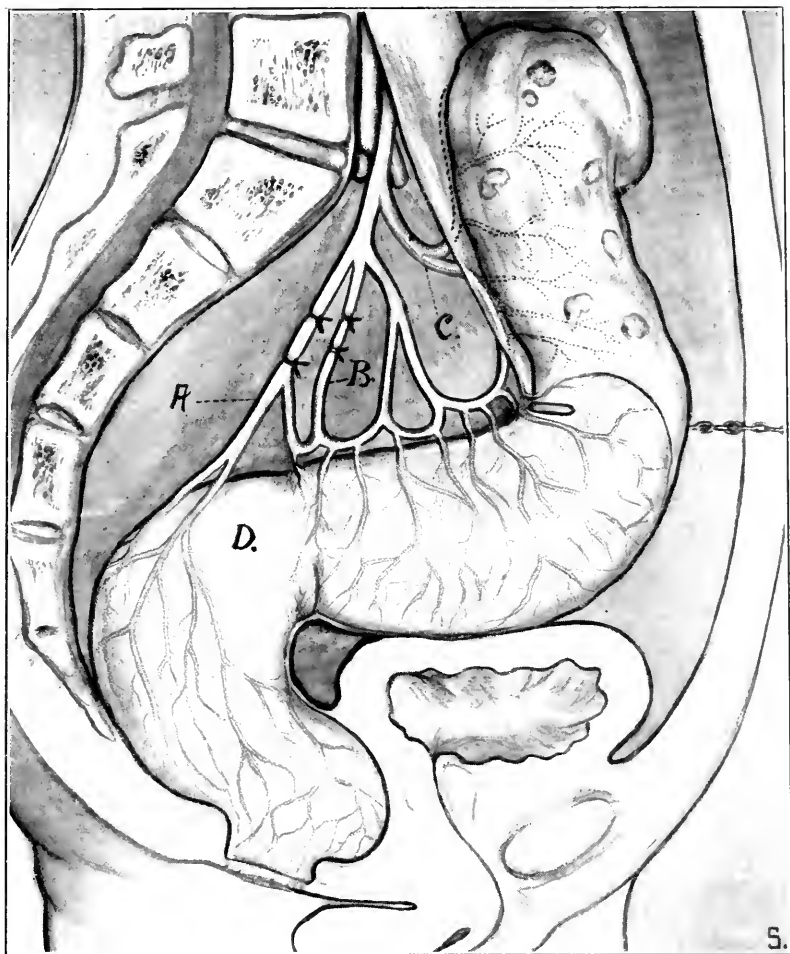
Combined Operation for Carcinoma, Showing the Blood Supply
to the Rectum, and the Method of Tying.

The other procedure, which we will call B, leaves the patient with an artificial anus, removing all the bowel, together with the perisigmoidal and perirectal fat and glands below the artificial anus. This is the operation which a great many surgeons believe should have preference over all others, as it is the most radical and insures the patient a better chance of ultimate recovery and freedom from recurrence. Each of these operations has its own advantages, and both have, we believe, a place in surgery. It is useless to lay down any hard-and-fast rules as to the procedure that should be followed in dealing with cancer of the gastro-intestinal tract. Each case is a law unto itself and should be treated according to the conditions which are found at the time of operation. It might be good practice, in one case, not to disturb the continuity of the bowel; whereas, in another case, it might be very bad practice.

The patient having been prepared in the usual manner, the rectum is irrigated with pure formalin, this being followed by injections of peroxide of hydrogen. The peroxide of hydrogen is used to neutralize any ill effects from the formalin. The patient is first placed on the right or left side, and the sacral plexus anesthetized by the method described in a former chapter (see page 53). This having been done, the patient is then placed in the prone position, and the abdomen having been prepared as for other abdominal operations, an incision is made in the median line and continued to one side of the umbilicus—preferably the left. It is very important to make a large incision so that the operator may work with comfort. The fascia having been incised, the recti muscles are separated, the abdomen opened in the usual manner, and the patient immediately put in the Trendelenburg position.

It is then important, before proceeding with the operation, to have the small intestine packed off in order that the subsequent steps may be simplified. The writer prefers one large laparotomy pad, about the size of an ordinary towel, to a number of smaller pads for walling off the small intestine. The small intestine having been thoroughly walled off, the table is returned to the ordinary position. A self-retaining retractor is now placed in position, and by means of this easy access is had to all parts of the pelvis. The surgeon needs very little assistance for the subsequent

steps of the operation. It is an advantage not to have an assistant's hand in the way, increasing the danger of infection.

Up to this point both operations are the same, but from now on the procedures are somewhat different. We will first describe operation A.

Operation A.—The sigmoid is next pulled out of the wound and held taut. When this is done the sigmoidal artery stands out prominently. The peritoneum is then incised just above where the sigmoidal artery is given off. A pair of scissors, curved on the flat, is passed into the opening in the peritoneum, the peritoneum is gradually separated from the bloodvessels and glandular tissue inside. A thin spatula-retractor is slipped into the incision, and, using this as a guide, the peritoneum is incised parallel to the gut down to the peritoneal reflexion. The gut is then turned over to the other side and the same process repeated. The sigmoidal artery is double-tied and cut between the ligatures. Now, by means of scissors curved on the flat, the bowel with all the fatty tissue and glands can be scooped out with very little difficulty.

The superior hemorrhoidal artery is next double-tied and cut between the ligatures. This having been done the rectum can be separated from its attachment to the sacrum as far down as the levator ani muscle. Care should be taken, however, not to injure the middle sacral artery. If this artery is not injured, the operation is a bloodless one.

A piece of gauze is now packed into the pelvic wound. The operator proceeds to separate the rectum from the bladder, or the uterus, as the case may be. This having been accomplished by gradual dissection with the fingers, the rectum is separated from the bladder and prostate in the male, and from the uterus and vagina in the female.

The next step is the removal of the gauze from the pelvis. Having loosened the gut sufficiently, and being satisfied that the blood-supply is perfect and that it can be brought down to the anus without tension, from here the technique varies, according to conditions, as follows:

Operation B.—If a permanent colostomy is decided on the following procedure is adopted: The abdomen is thoroughly walled off with pads, and the bowel divided between two clamps

PLATE IX
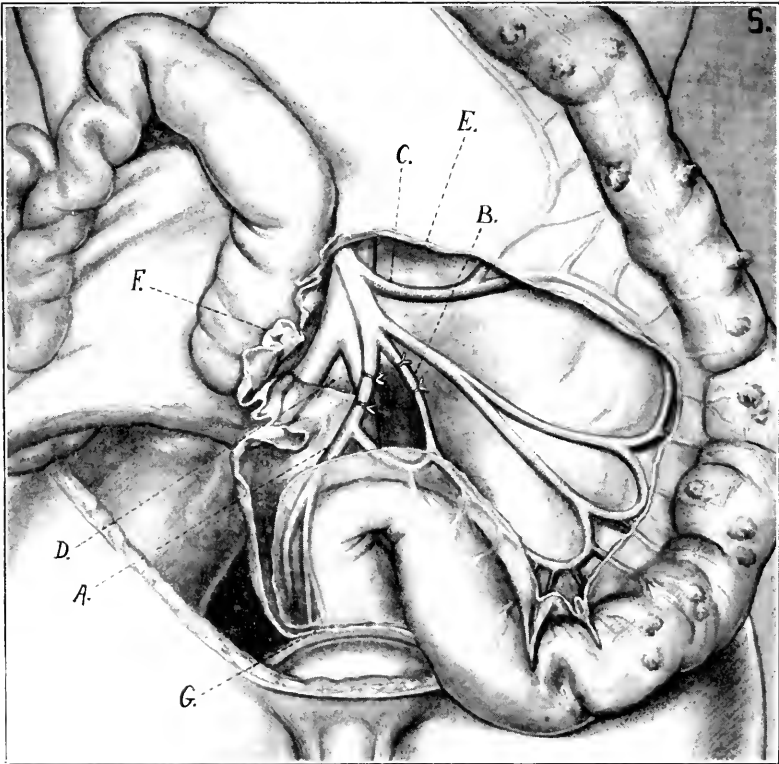
Combined Operation for Cancer of the Rectum, Showing the
Method of Stripping the Peritoneum Previous to Tying
off the Blood Supply.

by means of a Pryor clamp-cautery. The latter minimizes the
chance of infection and has the still further advantage of sealing
both ends of the bowel, so that there is not any possibility of
infection resulting from this source. The proximal end of the
divided bowel is covered with a gauze pad and tied with a tape.
The distal end of the bowel is held up by an assistant, and the
operator, having first tied the superior hemorrhoidal artery,
proceeds to remove the distal end in the following fashion:

Both layers of the peritoneum are cut, the bowel is separated
from the sacrum posteriorly as far down as the levator ani muscle;
the peritoneum is separated from the bladder or the uterus, as
the case may be; the operator proceeds to separate the bowel
anteriorly from the bladder and prostate in the male, and from
the uterus and vagina in the female.

This having been accomplished, a Wales bougie is passed
into the rectum and the gut tied over the bougie by means of a
strong tape. The bougie is now withdrawn, and in so doing the
bowel is inverted.

At this stage great care should be taken to free the lateral
perineal attachments of the rectum, so that the subsequent opera-
tion of removing the distal end from below may be much easier
and shock minimized. The peritoneum forming the pelvic dia-
phragm is closed and all raw surfaces are covered with peritoneum.

The proximal end of the gut is treated in the following manner:

1. In the wound.

2. Or a separate opening is made some distance from the
original wound.

3. Or it may be brought out between the external and internal
oblique muscles, as in any permanent artificial anus.

However, the technique of making the artificial anus will not
be repeated, as it has already been described in another chapter
(see page 432). A Paul tube is inserted in the proximal end of the
gut, and the wound closed in the usual manner. Whichever
method is adopted a Paul tube should be tied in the gut to pre-
vent leakage and infection.

When the sigmoid is involved, especially at or near the apex,
several procedures may be followed. Unfortunately, however,
two of the operations, viz., resection with end-to-end anastomosis

and resection with lateral anastomosis, are followed by a high mortality on account of leakage. It occurred to the late Dr. Tuttle that it would be much safer if the tumor with the involved glands could be brought entirely outside of the abdominal cavity and removed at a subsequent sitting, and he developed the following technique, which is known as the three-step operation.

Tuttle's Three-step Operation.—An incision is made outside of the left rectus muscle. It should be about four inches long in order to give plenty of room for subsequent manipulations. A self-retaining retractor is fixed in place, the patient put in the Trendelenburg position, and the small intestine walled off. The sigmoid is brought out of the abdomen and the peritoneal covering of the mesosigmoid slit along for a distance well above and below the tumor (Fig. 174), and peeled back to the posterior abdominal wall, exposing the bloodvessels and the surrounding tissues and glands, loosening the attachment of the gut and allowing it to be brought out upon the abdominal wall. The bloodvessels supplying the part of the bowel involved in the growth are exposed by pulling or milking away toward it the surrounding glands and fatty material. The artery and veins can then be seen clearly, and the main vessel supplying the involved portion is cut and tied in two places, as shown in Fig. 174. The gut is thus loosened and can be pulled freely out of the abdominal cavity. The stump of the bloodvessels is pushed back between the two peritoneal layers of the mesosigmoid which are then stitched together, covering up all the denuded surface in the peritoneal cavity. The two legs of the loop of the sigmoid are now brought together by one row of sutures running along the border of the mesentery and well within the peritoneal cavity, and then by another row taken for the same distance through the long muscular bands. Two flat sutures of the bowel are thus approximated.

With the tumor well outside the abdomen the peritoneum and then the skin are stitched about the two legs, and the whole is covered with rubber tissue and left *in situ* from twenty-four to seventy-two hours, according to the condition of the patient. If there is any indication of obstruction a puncture can be made in the upper leg, allowing gas to escape; or if gangrene should be imminent in the exposed loop there is no reason why it should

not be excised any time after eighteen hours, or even less. The
growth can, and has been, removed at the end of twenty hours,

Fig. 174
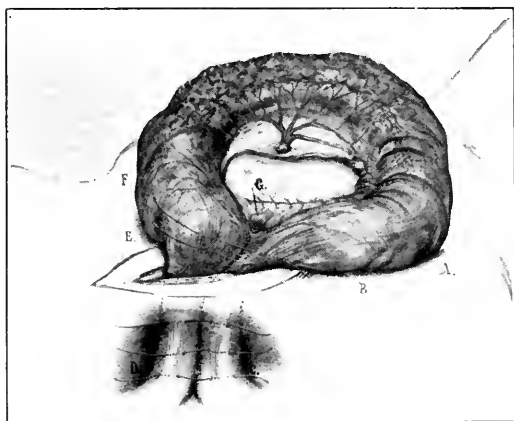
Tuttle's operation—first step.

Fig. 175
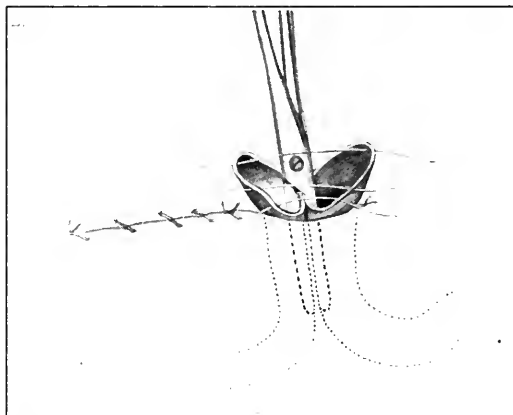
Tuttle's operation for cancer of sigmoid; second step.

when necessity demanded, without any complications. When
the gut is excised it should be done by a V-shaped incision, as

in Fig. 175, so that there may be abundant material for bringing the ends together later.
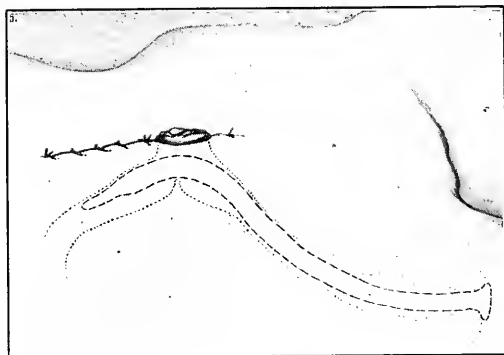
Tuttle's operation, third step, showing a long rubber bougie introduced so as to press back the lower wall of the united gut where the clamp has cut away the spur.

Fig. 177
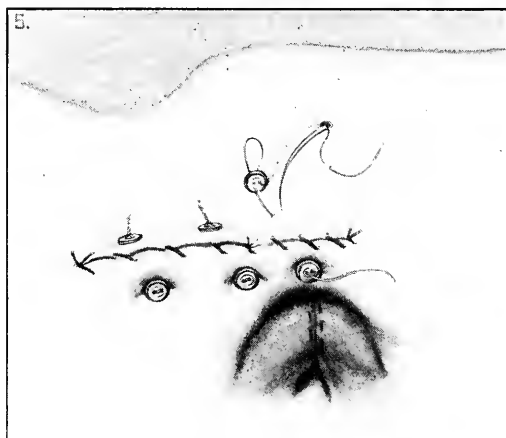
Tuttle's operation for cancer of sigmoid. (Reprinted from the Proctologist.)

It will be observed that since the main bloodvessel supplying this loop has been ligated there will be little or no hemorrhage and no pain in the resection; and there is no danger of peritoneal infection, as this cavity will have been closed off after the first

five or six hours. Almost a week should elapse before the clamp is put in to cut away the spur. A Pryor hysterectomy clamp, if used, should be introduced well into the two legs of the artificial anus, and will take from three to seven days to cut through and come away. A No. 8 Wyeth modified Wales bougie is then introduced through the rectum and passed beyond the artificial anus. Its tip will usually come out of the artificial anus, but must be reintroduced and carried on into the upper leg of the spur. Its elasticity will press the spur backward and cause the mucosa of the artificial anus to roll inward. The bougie is left in for two hours, three times a day, until the wound caused by the cutting away of the spur has healed and a wide aperture is left for the downward passage of fecal material.

The final steps are as follows: The edges of the artificial anus are dissected away from the skin and fascia of the abdominal wall down to the peritoneum; the aperture in the gut is sewed up by one row of through-and-through sutures and one of Lembert's, which must be carefully placed, the first being of silk and the last of fine chromic gut. The peritoneum is stripped from the abdominal wall for about half an inch all around the wound; the cicatricial tissue and the fascia are trimmed away; three or four double anchoring sutures threaded upon agate buttons are passed across the wound and out through the skin on each side about one inch from the margin; and after these have been tightened an ordinary subcutaneous suture brings the skin together. The buttons serve as bases for the deep sutures to rest upon and prevent their cutting into the skin, rendering them much less painful than the ordinary tension sutures; and if the wound should gape, one can twist the button like a tourniquet and bring the edges closer together.

Resection of the Rectum.—In resection of the rectum, when the tumor is situated at or near the peritoneal reflection, it is sometimes difficult to unite the ends of the bowel, except under tension. In such cases the procedure of Mummery, of London, has proved very satisfactory. A glass or heavy rubber tube is passed through the distal end, leaving about half an inch exposed. The proximal end of the gut is pulled over and fastened to the tube by means of a tape or purse-string suture. The distal end is then tied to

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the tube just below and in the same manner. An assistant now pulls the tube down, causing the upper or proximal end to become invaginated into the lower or distal end. A continuous Lembert suture completes the operation.

Fig. 178
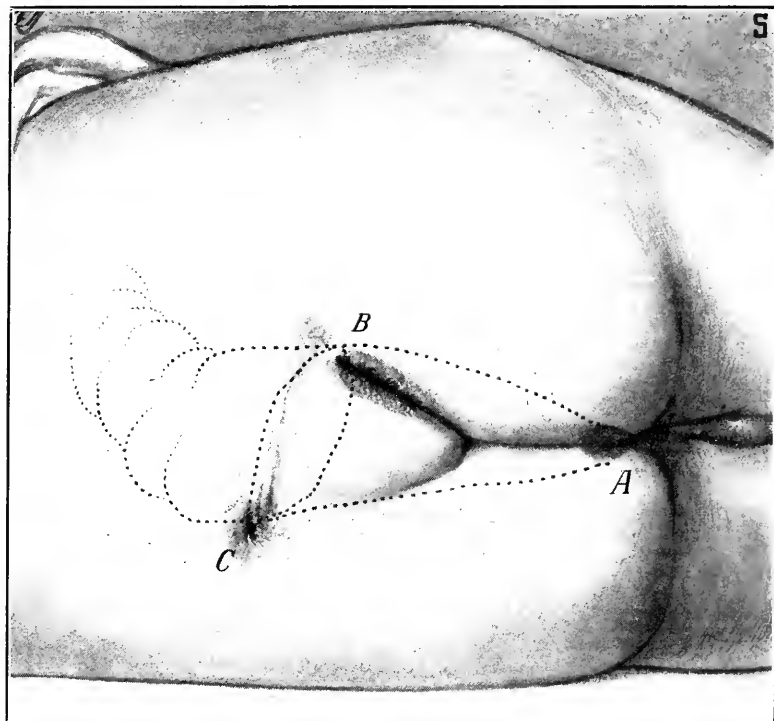
A fistula of the line of union of the bowel in a bone-flap operation. Carcinoma of the rectum. (Tuttle.)

Kelly's operation is indicated where, after the removal of the tumor, the distal end of the gut is cut so high or close to the peritoneal reflection that difficulty in manipulation is an obstacle to anastomosis. The lower end of the intestine is closed in the usual manner and a longitudinal incision is made anteriorly through the peritoneum and rectum. The rest of the technique differs from that of Kelly in that instead of sutures we use a rubber tube which is introduced into the proximal end of the

gut, and over which the intestine is tied by means of a tape or purse-string suture. It is then passed down through the anterior rectal slit, and, after dilatation of the sphincter, delivered through the anus by an assistant. The proximal end of the bowel is then slightly invaginated by traction and union is secured by means of Lembert sutures. The tube is held in position and prevented from retracting into the bowel by means of adhesives or by suture to the skin.

Resection of the Sigmoid.—An incision is made in the outer side of the left rectus muscle. After the abdomen is opened the patient is put in the Trendelenburg position and the small intestine is walled off from the field of operation by gauze pads. The sigmoid with the growth is now isolated, and the mesentery is examined for lymphatics. The amount of gut to be resected is determined and four clamps are placed, two on each side, and at some distance from the growth. The diseased bowel is removed by cutting between the clamps. If sufficient bowel is left after the resection for the proximal and distal limbs to overlap, each is closed by a purse-string suture, and they are united by the usual methods of suture in lateral anastomosis, which we are convinced is preferable to end-to-end union in this particular situation.

If lateral union cannot be made without tension, the outer leaf of the mesentery of the descending colon should be incised, and perhaps also the ligaments supporting the splenic flexure may be divided, thus allowing the transverse colon to come down and form the anastomosis with ease.

After-treatment.—For the first twenty-four hours after operation the patient should be watched very closely. We are in the habit of allowing the patient to drink all the water he desires, following operation; we further believe in giving the patient sufficient morphine to keep him comfortable and free from pain for at least twenty-four hours. If the condition of the patient indicates it, we give a transfusion. By the way, this should always be ready to be given at a moment's notice after all these operations.

After twenty-four hours the patient is given a little beer to drink. The morphine is discontinued and the patient is given deodorized tincture of opium, 5 minims three times a day. This

is kept up until the end of the first week, or just before the bowels move.   As a general rule these patients suffer from distention, eructations, and belching of gas.   If this proceeds, and the patient's condition permits, the stomach should be washed out with a warm saline solution, to be followed later by dilute hydrochloric acid, 20 to 30 minims in a glass of water every four hours.   It has been shown that these patients are generally lacking in hydrochloric acid; and, as the latter is an excellent disinfectant, we always prescribe it, and the virtue of it has been substantiated by clinical experience.

As soon as the condition of the stomach permits, we give these patients kumyss, unless contra-indicated by impaired vitality, beer, also white of egg with a little pepper and salt added.   After forty-eight hours the patient is given thick soups, and two or three days later a little meat is allowed.

We are great believers in conserving the strength of the patient by early feeding after operation.   We get the patient out of bed as soon as he is able to stand the strain, and that is generally in a week or ten days after operation.   We can attribute many excellent results to this fact.   In the first place the patient begins to feel that he is getting along and improving; the drainage is better, the patient sleeps better, and the mental attitude is improved.   A very promising method of feeding these patients is the intravenous infusion of grape-sugar.   After the end of a week the bowels are moved by giving a dose of oil, calomel, or cascara.   Previously the bowels are regulated by a warm saline solution, and this is followed by an injection of olive oil, which is retained for some time.   After the bowels have moved, the rectum is irrigated with a warm saline solution, and this treatment is always indicated after a movement of the bowels for several weeks following operation.   The posterior packing is removed at the end of forty-eight hours and, provided there is no bleeding, is not restored.

Prognosis.—The prognosis, to a great extent, depends on the location of the tumor, the length of time it has existed, the involvement of the neighboring and remote organs, and the condition of the patient.

Tumors situated close to the anus almost invariably recur; this

is probably due to the fact that in the neighborhood of the anus the lymphatic and blood-supply is greater than in other parts of the rectum. In tumors two inches or more from the anus the prognosis is more favorable. When the growth is between the sigmoid and the rectum, if the case is diagnosed early, the prognosis is good; but where it has existed for some time there is usually involvement of the bladder in the male, and of the uterus and broad ligaments in the female, making the prognosis bad in the former and somewhat less so in the latter because of the greater ease of removal of the female organs. In tumors of the sigmoid the prognosis is very good, because they remain localized for long periods, due to the almost entire absence of lymphatics in this organ.

Of course, inflammation of any organ other than the rectum must influence the prognosis, because the operation then becomes much more difficult, or, it may be, impossible. Above all, involvement of the liver is the most serious. If that is involved, no matter how localized the tumor is, the operation is contra-indicated except for the relief of obstruction.

Kocher is of the opinion that lymphatic enlargement, even of the prevertebral glands, is not a contra-indication to operation, since, he believes, this is frequently simple inflammation of a secondary character. He has operated on some cases, which he thought at the time were apparently hopeless on account of the lymphatic enlargement, and subsequently reoperated and found that this had disappeared. He therefore inferred that what he had supposed to be cancerous tissue was simply inflammatory. This may not have been the true explanation, because very often when the original focus is removed, even though the glands are involved, the patient develops antibodies in the blood which cause disappearance of the remaining cancerous tissue.

General Condition of the Patient.—It is necessary in all cases to consider the general condition of the patients, many of whom are in a run-down or cachectic condition, with vitality lowered by chronic obstruction or intestinal putrefaction or hemorrhage, and perhaps with arterial degeneration. In such patients the prognosis is poor even though the tumor may be removed with ease. A successful operation where the patient dies is rather discouraging.

Palliative Treatment.—The palliative treatment for inoperable cases consists of any and every measure that promotes the patient's comfort and well being. We believe that any means is justifiable if it affords relief, and we have no sympathy with the surgeons or physicians who refuse to cater to the cases of these unfortunates. They should be made as comfortable as possible so long as they live.

Several investigators have found that the protoplasmic substance of malignant epithelial tumors in human beings can be injected subcutaneously, in large quantities, without injurious results. This form of treatment has been tried in carcinoma, and in some inoperable cases has helped to soften the tumor mass; and in one reported case, the growth had almost entirely disappeared. In general, however, the results were far from satisfactory and it is questionable whether the treatment is worthy of trial. Hodenpyl, a few years ago, used the ascitic fluid from a woman affected with carcinoma on other patients suffering from the disease. The results were encouraging in some cases, but the success was limited. Judging by the fact that the treatment is seldom used, it cannot have come up to the expectations of its advocates.

Erysipelas.—It has been known for a long time that the *streptococcus* of erysipelas alone, or mixed with other bacteria such as the *Bacillus prodigiosus*, has cured some malignant cases. Coley's fluid, which has been used extensively and with success in cases of inoperable sarcoma, is a combination of the two above-named bacteria. Durante has noted the cure of two cases of cancer by an intercurrent erysipelas. In one the erysipelas attacked the ulcerative focus, producing gangrenous degeneration of the entire neoplasm, which was cut off and left a vast defect of substance, but filled in with a healthy scar and the patient has been in good health for ten years since. In the other case, an epithelioma, the same thing happened; but the patient succumbed a year later.

From our own experience we are inclined to believe that the *Streptococcus erysipelatis* has some inhibitory influence on the growth of cancer. A case in the practice of the writer's colleague, Dr. Tuttle, developed a streptococcus infection some weeks after-

the removal of an adenocarcinoma. This patient did not pick up at first, and gave one the impression of being cachectic; but, after he recovered from his erysipelas, he showed striking improvement, gained weight rapidly, and is now in the best of health, three years after the operation. One inference from this case (though not susceptible of proof) is that the streptococcus removed the toxemia, which seemed to linger after the excision of the tumor. It must be understood that this is simply our impression and we do not wish to imply a recommendation of streptococcus injections, except in hopelessly inoperable cases. Vaughan[1] reported some good results along the same line.

Trypsin.—Beard, of Edinburgh, first suggested the use of this enzyme for the relief of inoperable carcinoma, and, though his reasons were entirely theoretical, he let the impression go abroad that it was the long-sought-for remedy. We gave it a fair trial on a dozen or more cases and could not see that it had any effect on the growth or development of the tumor. Apparently, however, the trypsin did have some effect on the mental attitude of the patient, and helped in some way in the elimination of the carcinomatous toxins. Our experience has been borne out by other surgeons, who have tried the remedy more extensively, and the verdict of all has been that it is not a curative remedy.

Other Medication.—Balsam of Peru has been thought to have a beneficial effect when applied locally in some cases. Sticker related a number of instances in which rapidly growing, round-celled carcinomata in dogs were completely checked in growth by an application of charcoal. We give the above for what it is worth, having had no personal experience along these lines.

[1] New York Medical Journal, May 21, 1910.

CHAPTER XXIX.

SHORT CIRCUITING.

LARDENNOIS and Okinczye[1] present the following procedure as a more logical, a technically simpler and a more efficacious method of "short circuiting" the large intestine for grave chronic obstruction or rebellious colitis.

After various experiments in cecosigmoidostomies, the authors finally arrived at the following perfected operation:

The patient is placed in the Trendelenburg position and a long median incision is made from the pubes to the umbilicus. The colon is rapidly explored for the clinical lesions and the termination of the small intestine inspected for the only possible contra-indications to this operation, namely, a stenosing band across the ileum.

First Step: The cecum and sigmoid flexure are brought well up into the wound. This is easily accomplished as lesions for which the operation is indicated are usually accompanied by a "cecum mobile."

Second Step: This consists in the approximation of the mesenteries and the closure of the buttonhole formed by the mesentery, the posterior parietal peritoneum and the pelvic mesocolon. This is done as follows (Lane's technique): Beginning with the right surface of the mesocolon, a suture is run from the sigmoid to the posterior parietal peritoneum and the sacral promontory and thence to the left surface of the mesentery close to its termination. Great care is exercised to avoid bloodvessels. The two ends of the suture are held in a clamp and are not tied until the anastomosis is completed.

Third Step: Appendectomy is performed quickly, as the appendix interferes with the anastomosis.

[1] Jour. de chirurg., 1913, x, 538.

Fourth Step: An intestinal clamp is placed above the bottom of the cecum to mark the limit of the cecum which is to be resected.

Fig. 179
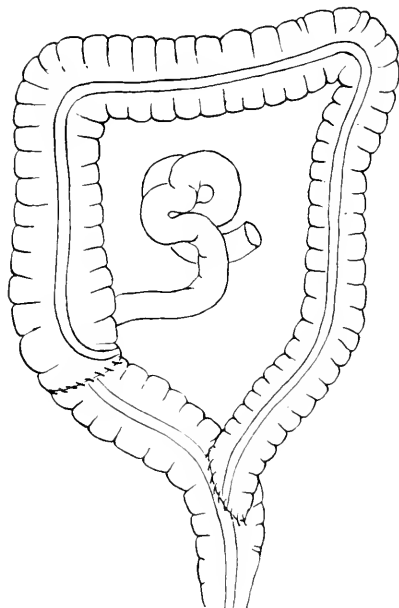
"Short circuiting," showing result to be avoided. The Y is inverted due to the excessive length of the sigmo-sigmoid segment. The section of the colon has been made too low and the two anastomoses are too close together. (Lardennois and Okinczye.)

Fifth Step: After milking away the contents, two intestinal clamps are placed on the sigmoid. It should be cut high enough toward the colon to make the right cecosigmoid branch a little longer than the left colon sigmoid branch in order to leave some distance between the two anastomoses. If the colon loop is too long, the Y will be inverted, which might lead to a vicious circle (Fig. 179). The two clamps should include most of the depth of the mesocolon and the extremities should be in apposition.

Sixth Step: The iliac sigmoid is now cut between the clamps, the cut surfaces being cauterized. The mesocolon is cut to the end of the long clamp and immediately sewed over to control hemorrhage. The upper extremity of the cut colon is wrapped in saline gauze and laid aside.

Seventh Step: The inferior end of the sigmoid is placed in apposition to the cecum and the posterior layer of seroserous sutures is passed (Fig. 180).

Eighth Step: The anastomosis between the cecum and sigmoid is completed, both sigmoid and cecum being cut across just proximal to the sealing clamps before the sutures are passed.

Fig. 180
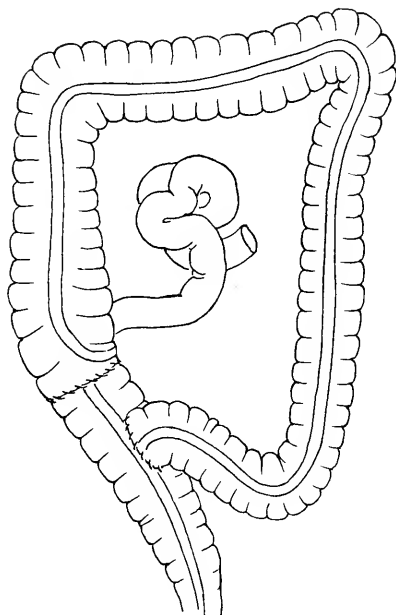
Showing the correct result.   Approximating sutures below the sigmo-sigmoid implantation to fix the angle of the Y.   (Lardennois and Okinczyc.)

Ninth Step: The compresses are removed from the superior end of the cut sigmoid and, after choosing a point far enough from the cecal anastomosis and at the same time high enough so that the work can be done outside the abdomen, the sigmo-sigmoidostomy is done in the usual manner. This presents no particular difficulty as patients for whom this operation is indicated usually have a long sigmoid.

Tenth Step: The suture as passed in step two is now tied just tight enough to close the opening in the mesentery and the operation is terminated by replacing the intestines and closing the

abdomen. The result obtained is represented schematically by Fig. 180.

Ileosigmoidostomy.—After having been previously carefully prepared, and all the rules laid down by Sir Arbuthnot Lane followed, the patient is given $\frac{1}{150}$ of a grain of hyoscine and $\frac{1}{2}$ grain of morphine three or four hours before the operation. The patient is anesthetized and the abdomen opened by median incision. The ileum is double clamped about three inches from

FIG. 181
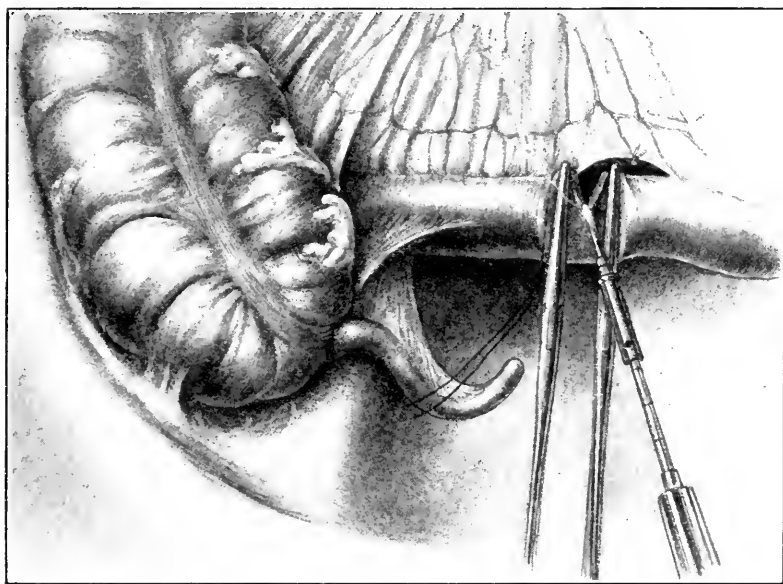
First step in Lane's operation (ileosigmoidostomy). (Lynch.)

the ileocecal valve, as in Fig. 181. A purse-string suture is placed around the distal loop of the ileum close to the clamp, as in Fig. 181. One little bloodvessel is tied, as in Fig. 181, permitting a separation of a portion of the proximal limb from the mesentery so that it can be swung around and attached to the sigmoid. The peritoneum, having been carefully walled off so that no soiling can possibly occur, the ileum is divided between the two clamps by means of the cautery, as in Fig. 181. The forceps is taken off the distal end, the suture drawn and tied, an assistant helping

to invaginate the end of the bowel. The proximal loop with the forceps in place is swung around to the left and the bowel rolled upward on the forceps for half a turn, as in Fig. 182 *A*. The portion of the sigmoid to be attached to the ileum is now selected, and the ileum, as in Fig. 182 *A*, sutured to the side of the sigmoid by Lembert sutures. The bowel is unrolled from the forceps and held in position by an assistant, while the surgeon makes a slit

Fig. 182
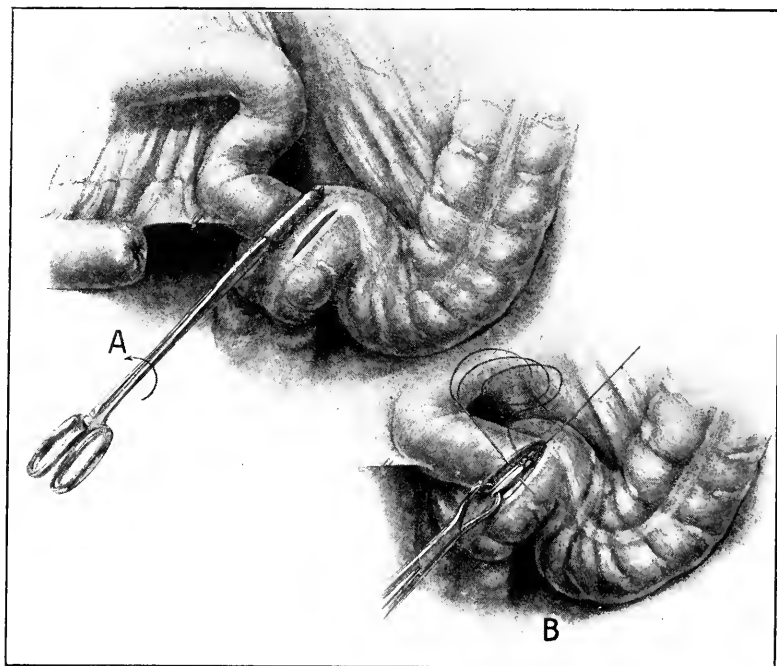
Second and third steps of Lane's operation. (Lynch.)

in the longitudinal muscular band of the sigmoid corresponding exactly to the size of the ileal opening. The rest of the operation resolves itself into an end-to-end anastomosis, *i. e.*, the ileum and sigmoid are united by glover's suture as in Fig. 182 *B*, and the operation is completed by means of a modified Connell suture, as in Fig. 183. Two rows of Lembert sutures are used to·afford further protection. We have now two rows of sutures in the back and three in the front. To prevent hernia of the small intestine

Fig. 183
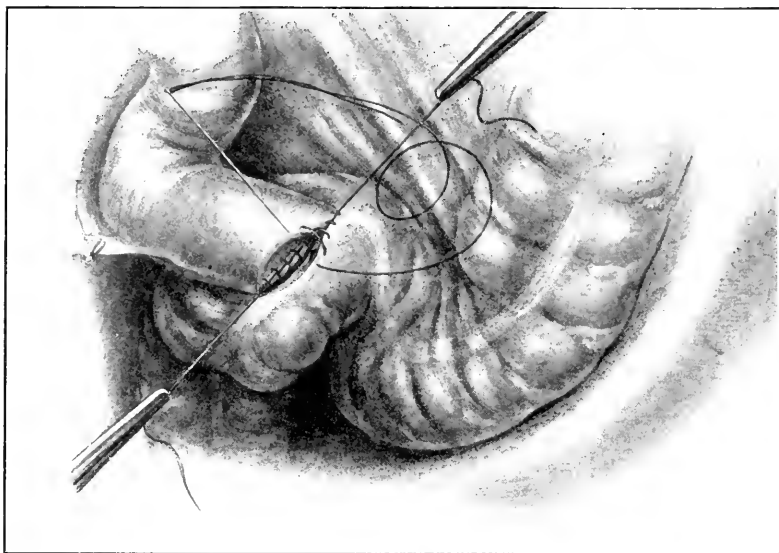
Fourth step of Lane's operation. (Lynch.)

Fig. 184
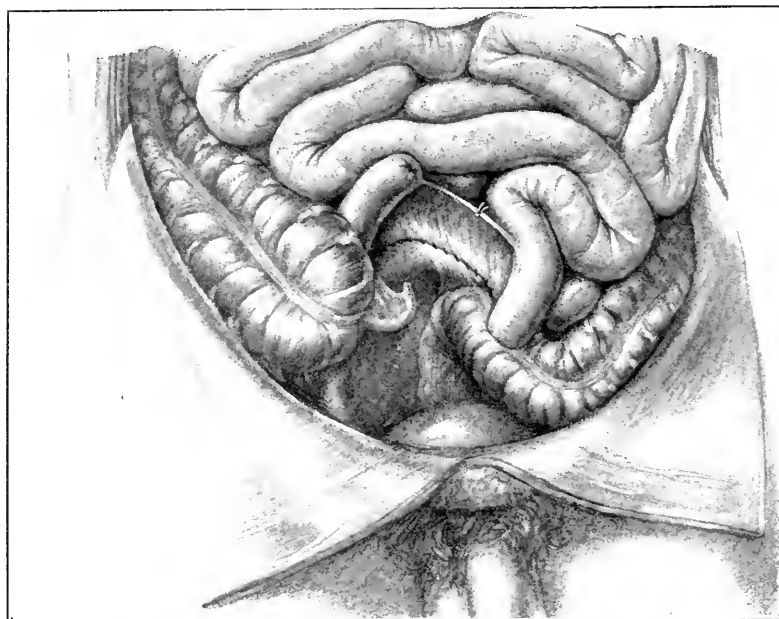
Lynch's modification of Lane's short-circuit operation (fifth step of the operation).

through the ileosigmoidal loop the iliac fossa must be closed off. This necessitates evisceration and seems to the writer the most dangerous part of the operation. After the evisceration, the mesentery of the small intestine is attached to the posterior abdominal wall and to the mesentery of the sigmoid, and thus the small bowels are prevented from falling into the pelvis. Instead of evisceration the author prefers to put the patient in the Tren-

Fig. 185
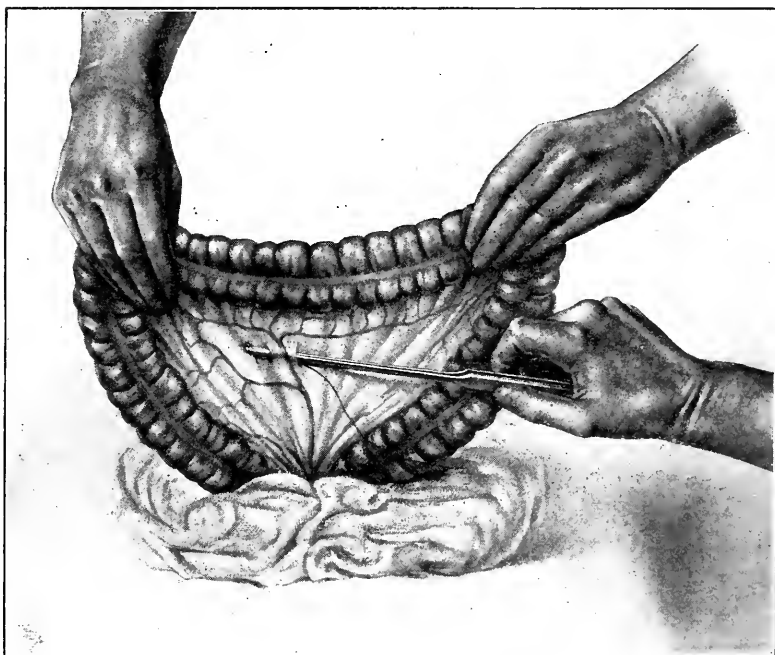
Colectomy.   Method of tying the bloodvessels.   (Lynch.)

delenburg position and to suture the mesentery of the ileum to the posterior abdominal wall from *below* instead of *from above* (see Fig. 184). Sir Arbuthnot Lane prefers to have a rectal tube passed up through the rectum and sigmoid by an assistant. After the tube has reached the ileosigmoidal opening it should be gently manipulated and guided through the opening by the operator's fingers, and passed into the ileum for about three inches. After the tube is in position it is sutured to the bowel by one

plain catgut suture to hold it in place. Through the tube are introduced four or five ounces of Russian mineral oil, the operation is completed and the abdomen is closed.

Colectomy.—This operation should only be performed in cases of malignant growths, or where the colon is unusually redundant, especially in cases of non-fusion.

In stasis, Sir Arbuthnot Lane does not believe that the colon should be removed, except where it is unusually long and, as he expresses it, "invites removal." Excision of the colon under these circumstances is a comparatively simple operation. When the colon is fixed or short and in good position, colectomy is an extremely difficult operation. If the rules laid down by Sir Arbuthnot Lane for short circuiting and colectomy were closely followed, we would not have the bad results that are reported from time to time.

His rules are:

1. When there is a distinct kink with ileal stasis and the colon is in good position, short circuit.

2. When there is stasis with a colon that invites removal perform a colectomy with short circuiting.

In a great many instances short circuiting is performed on cases with redundant colon. If the colon is allowed to remain, it angulates and accumulates detritus; it is constantly moving around and gets into bad positions; gas backs up and accumulates in the large bowel; it is a constant source of worry to the patient; the surgeon who performed the original operation condemns the operation because it is not successful, and he does not realize that he has not adhered to the rules.

Operation.—A median incision is made about six inches long, three inches below and three inches above the umbilicus. This incision, if necessary, can be extended up or down. The transverse colon is held up by an assistant and the middle colic artery is first tied about one inch from the junction of the bowel with the mesentery, which is accomplished by passing a suture on a long forceps. After the middle colic artery has been tied a fairly large slit can be made in the transverse colon and the hand passed into the lesser cavity. With one hand in the lesser cavity the great omentum and gastrocolic omentum can be stripped over the

colon. It may require two or three sutures to prevent hemorrhage, but this part of the operation can be accomplished within a few minutes and with very little traumatism. With forceps and a long suture of iron-dyed linen the colon is gradually tied off. By passing a suture back and forth and tying a little at a time no raw edges are left, and the colon can be removed in a very reasonable time. After the colon has been thoroughly freed from its attachment to the mesocolon, an anastomosis is made between the ileum and sigmoid. After the anastomosis has been made the upper end of the sigmoid, about one inch above the anastomosis, is turned in and the excessive colon removed.

CHAPTER XXX.

FOREIGN BODIES IN THE RECTUM AND COLON.

FOREIGN bodies find their way into the rectum in divers ways. In the majority of cases they are taken into the stomach, passed through the intestinal tract, and become implanted in the anus. In other cases they are introduced both as the result of accident and by design.

In the case of young children, who are in the habit of swallowing everything they pick up, it is astonishing that these bodies do not oftener become implanted in the outlet of the bowel; but presumably an explanation can be found in the fact that they are covered by fecal matter, and so pass out without injury.

Pilcher reports the case of a woman suffering from melancholia who swallowed a number of foreign substances with the object of doing away with herself. She subsequently passed nineteen nails, a screw, some pieces of earthenware and glass, a piece of whalebone, part of a needle and two knitting-needles.

It was the custom in Balasore, on the Bay of Bengal, for the natives to put a dried clay plug in the rectum after moving the bowels. This was removed before the bowels moved again, and a new one adjusted (Ball).

Pierra[1] reports a very interesting case in which a stick $9\frac{1}{2}$ inches long and $1\frac{1}{2}$ inches in diameter, was passed into the rectum. It was subsequently removed without very much damage to the rectum.

The rectum is frequently used as a storehouse for precious stones and jewels. In South Africa the Kaffirs often swallow or secrete valuable diamonds in the rectum. It is customary in these mines to strip the Kaffirs and search them after a day's work. In other cases, if there is any suspicion, they are given a cathartic and the stools passed through a sieve. Often diamonds have been recovered in this way.

[1] Indian Medical Record, 1896, p. 131.

There are innumerable cases on record where all kinds of foreign substances, from bottles to pins, have been introduced into the rectum. These conditions, however, are rare and not worth enumerating. The cases which the majority of surgeons are called upon to treat are those where small foreign substances have been swallowed, such as fishbones or needles, and then become implanted in the anus.

Foreign bodies are most frequently found in the little crypts or pockets of Morgagni which surround the anus, and these little valves offer an obstruction to the exit of foreign substances.

Foreign bodies may be swallowed and fecal concretion form around them, resulting in intestinal obstruction. This is particularly apt to occur if the individual suffers from angulation, stricture, or tumors. One such case came under our observation where the patient had swallowed a plum pit, which caused intestinal obstruction.

There are people who have a habit of chewing hair, and cases are on record where this habit has resulted in the formation of a foreign body, either as a result of the hair, or fecal concretions around the hair mass.

Symptoms.—The symptoms, to a great extent, will depend on the location of the foreign substance and the amount of damage done. If the foreign substance causes a perforation, the early symptoms will be those of peritonitis, and the severity of the peritoneal infection will depend on where the foreign body perforated. If the perforation occurs near the stomach the symptoms will not be so pronounced as if the perforation occurred in the lower ileum or sigmoid where bacterial life is more abundant and virulent. However, peritonitis will result in either case, the degree of infection being greater below than above. On the other hand, if the body is large and obstruction results, the reverse will happen, as the higher the obstruction the more fatal the result. The majority of cases of implantation of foreign substances are located in the anus, and, if not discovered early, abscess usually results. In such cases the symptoms are those referable to an abscess. The severe pain during defecation compels the patient to seek a doctor and a local examination leads to diagnosis. Fishbones are the most frequent foreign substances

swallowed and they are usually arrested in the crypts, causing severe pain; but, as a general rule, they are recovered before much damage is done. A sharp, shooting or stabbing pain, especially during the movement of the bowels, is the most pronounced symptom of the presence of a foreign body. The writer saw one case in which this was the only symptom. He subsequently removed a needle, after which the patient had no further inconvenience. An abscess may be the earliest symptom, but, in the majority of cases, there is some previous indication. In some cases there is tenesmus with a desire to move the bowels, followed by an increase of pain. In other cases, the symptoms are those of ulcer, with the passage occasionally of a little blood. If the foreign body is very large, pain in the pelvis with obstruction may be the first indication. Some of the other symptoms are dull, aching pain, aggravated by motion, sitting, or any pressure on the perineum. Movements of the levator muscle will increase and the pain result in a spasm in some cases.

Constipation may be the only symptom, and is due either to the foreign body causing the spasm in the colon, to the pain resulting from defecation, or to ileus resulting from severe pain. Other symptoms are dysuria, cystitis, neuralgia, sciatica, pain in the back, a bearing down feeling, with prolapse of the bowel, bulging of the vagina or perineum, and hemorrhage. In one case that came under the observation of the writer the foreign body perforated the bowel, lodging over the sacro-iliac joint and resulting in very severe sciatica.

Complications.—Abscess formation is probably the most frequent complication following the presence of foreign bodies in the anus. The abscess, if not properly treated, may terminate in a fistula. Suppuration, with inflammation between the rectum and other organs, occasionally occurs. If the foreign body is large and situated in the colon, rupture may result. Of course, a perforation of the colon is much more serious than perforation of the rectum. Intestinal obstruction, either acute or chronic, should be considered as a complication.

Diagnosis.—The diagnosis of foreign bodies depends to a great extent on their location. If situated in the anus they can be easily reached by the finger, but it may require an anesthetic

in order to make a satisfactory examination. When situated higher up the diagnosis can usually be made by the x-ray. In one of the writer's cases he was able by this method to locate the foreign body before operation.

Treatment.—The treatment of foreign bodies depends to a great extent on the location and nature of the foreign substances. When they are situated low down in the anus, or in the rectum, and not too large, they can be conveniently dealt with when the patient is under a general anesthetic.

Sometimes the foreign substance is quite large. Especially is this so in cases where bodies have been introduced from below. In some cases where bottles and glass have found their way into the rectum it requires a great deal of skill and ingenuity to extract them without serious damage to the surrounding tissues. When difficulty is experienced in delivering the body through the sphincter, it is much safer to cut the muscle than to overstretch or tear it during delivery. The little semilunar valves occasionally contain foreign substances such as pins, fishbones, and beads, and it is not always easy to locate them.

CHAPTER XXXI.

SERUMS AND VACCINES.

THERE are many inflammatory conditions of the colon and rectum which are only partly amenable and in some instances totally unamenable to surgical treatment. Some of these conditions have been demonstrated to be caused by certain definite bacteria or protozoa, such as epidemic dysentery, the infectious colitis and amebic colitis. In all of such cases the offending organism must be demonstrated either in the feces or from smears or cultures made from the mucous membrane where accesssible. It is probably not very far from the truth to state that the underlying causes of most of the infections of this tract have not as yet been identified.

Excluding the common infectious diseases in the course of which inflammatory conditions of the gastro-intestinal tract may and often do occur during the course of the disease or as complications, the bacteria identified as causing the local disturbance are but few in number.

The following is an incomplete list of bacteria that are found in the gastro-intestinal tract:

I. Pathogenic.

  B. typhosus.

  B. paratyphosus $\begin{cases} (a) \text{ Food poison-} \\ \quad \text{ing (uncommon).} \\ (b) \text{ Enteritis (meat} \\ \quad \text{poisoning group).} \end{cases}$

  B. paracoli (indefinite group).
  B. dysenteriæ.
  B. paradysenteriæ.

II. Non-pathogenic, but on some occasions pathogenic.

  B. coli.
  Streptococcus (fæcalis).
  Staphylococcus and streptococcus.
  B. proteus (food poisoning).
  B. pyocyaneus (food poisoning).
  B. capsulatus (indefinite group of which the aërogenes is the most uncommon).
  Pneumobacillus (Friendländer).
  Bifidus group (non-pathogenic).

In many of the chronic conditions the bacterial infections are only secondary to the primary conditions which may be congenital malformations and dilatations, adhesions, kinks, obstruction,

the various new growths, improper diet, neglect of the bowels, and abnormally long bowels, and so on. The conditions should first be remedied, if possible, medically or surgically, but the bacterial cause gives the physician or surgeon a very powerful aid in treatment either before or after operation if that is necessary. Operative treatment alone will often not be sufficient, so that recourse should be made to serum therapy, and to what offers a larger and more useful and practical field, vaccine therapy.

It is not within the scope of this chapter to discuss the broad field of protozoa, syphilis, or typhoid fever; the treatment of these conditions is discussed in other works. It is concerned with the obscure infections which are only obscure on account of the failure to properly identify the bacteria involved in the process. We must take our lessons from the methods of discovery of the well-known infections and from the treatment of the same.

It is first necessary to know something concerning the bacteria that are present in the normal intestinal tract. Of these the commonest one that is always with us is the *Bacillus coli*. This is only a group, of which there are innumerable varieties. Under ordinary conditions these bacteria are non-pathogenic when the mucous membranes are intact, but may become virulent through injury and ulcerative processes. It is also to be noted that *B. coli* is extremely pathogenic to lower animals, as the guinea-pig, rabbit and mouse, when introduced into the peritoneum or circulation.

Immunity.—In dealing with this subject we must consider (*a*) the control of the local condition of the bowel and (*b*) the control and improvement of the general condition of the body. The latter brings up directly to the subject of immunity. *Immunity* may be defined as the power which certain living organisms possess of resisting infections. There are several theories of immunity. Pasteur's "exhaustion theory" was largely based on his work upon fermentation of sugar with yeasts. He regarded the body immune because the substances necessary to the growth of the bacteria were used up. The fact that bacteria may grow well in the dead tissues and fluids of immune animals and also the fact that dead bacteria produce immunity disproves this theory. Ehrlich has revived this theory in a modified form.

He considers that there is sufficient evidence for this form of immunity in certain cases, as in cancer. Ehrlich calls it "atreptic immunity." Chauveau's "retention theory" is that the products of bacterial metabolism are retained within the organism, thus protecting it against further growth. The "humoral theory" is that in certain diseases the immunity is due to substances floating in the blood. The "cellular theory" is that in some diseases the immunity seems to reside in the activity of the cells.

Immunity may be natural or acquired. "Natural immunity" is an inherited character, possessed in common by all individuals of a given species. "Acquired immunity" is resistance to infection acquired during the life of an individual, and in four different ways: (*a*) by introduction of a virus, (*b*) by an attack of a disease, (*c*) by introduction of a vaccine, (*d*) by introduction of a toxin. Acquired immunity may be "active" or "passive." "Active immunity" is where the individual or animal produces its own antibodies. "Passive immunity" is where the antibodies are transferred from an animal to an individual as in the case of antitoxic sera.

Immune sera contain a variety of *antibodies: Agglutinins,* which cause clumping of bacteria; *opsonins,* which prepare bacteria for the ingestion by leukocytes; *antitoxins,* which neutralize toxins, and *precipitins,* which precipitate the specific proteid which causes their formation. Immune bodies are those which cause the destruction or lysis of specific blood-cells or bacteria by attaching themselves to the cells or sensitizing for action of the complement. The complement is a thermolabile substance found in all freshly drawn serum in variable quantities. It is not increased by immunization; it is destroyed by heating to 56° F. for fifteen minutes and slowly dissipates at room temperature. *Anaphylaxis,* also called hypersusceptibility, is a condition of exaggerated or unusual susceptibility of the organism to foreign proteins. This condition may be congenital, acquired, local or general, and is specific in nature. Although the term anaphylaxis was used by Richet to describe a condition contrary to prophylaxis, this condition of hypersusceptibility is looked upon as a distinct benefit and advantage to the organism, especially

in such diseases as smallpox, tuberculosis, and glanders. In these
diseases the power of accelerated or immediate reaction protects
the individual. Therefore the prophylaxis depends on the ana-
phylaxis, and the word anaphylaxis is a misnomer. Anaphylaxis
may be produced experimentally in guinea-pigs by the injection of
a small qunatity ($\frac{1}{4}$ c.c.) of normal horse serum, and after an
interval of from eight c.c. to fourteen days, another injection of about
10 c.c. subcutaneoulsy. After about five or ten minutes, the
animal gets restless and scratches at its mouth, supposed mani-
festations of respiratory embarrassment. Sometimes there is
irregular breathing, discharge of urine and feces, followed by
complete paralysis, convulsions, and death. The blood shows
leukopenia and diminution of complement. Sensitization may
also be caused by feeding guinea-pigs on meat or serum. This
fact would suggest possible sensitization in man against certain
protein substances and may throw light on those interesting
and obscure cases in which the eating of fish or bad meat causes
serious symptoms resembling those of anaphylaxis in all essential
respects (Rosenau).

If we grant that any immunity against a local or general con-
dition is to be sought in order to aid in fighting diseased con-
ditions, the first thing is to find the offending organism. This is
not always an easy matter. We must have recourse to (1) cultures
from the blood, (2) cultures from discharge of mucous membrane,
and from pus in abscesses if present, (3) agglutination and com-
plement-fixation tests against certain well-known organisms and,
for a more positive proof, to combination of all three methods. As
soon as the bacteriologist has confirmed the organism, a process
which takes from twenty-four hours to three days, two methods
of treatment are open: (a) the administration of vaccines, auto-
genous and in rare instances stock vaccines, to (b) the use of sera
which may also be stock or produced by inoculation of animals.
The autogenous sera method is slow and its value unknown.

We will first consider stock vaccines and sera. In the case of
well known and properly identified organisms, such as the bacillus
of dysentery or the gonococcus, the immediate administration
of stock vaccines or sera is a logical procedure, at least until a
proper autogenous product is obtained. In the case of the colon

bacillus, the large number of varieties practically necessitates the preparation of an autogenous vaccine and the high toxic action of this group upon the lower animals is a severe handicap to the production of a serum. Vaccines are less deleterious than sera and give more persistent immunity. They should be used only in chronic cases where there is time for preparation.

A stock serum of a well-known and identified organism can be administered and give immediate results as in the case of some dysenteries. Another factor in favor of the extended use of the vaccines is the absence of general anaphylaxis, except in excessive doses. There is always the danger of anaphylaxis in giving the sera.

The preparation of a bacterial vaccine. The organism is grown on a suitable agar medium and after twenty-four to thirty-six hours is washed off with normal saline. It is then heated to the lowest temperature that is required to kill, generally 56° to 60° C. It is then standardized by Wright's method, which consists of mixing equal parts of blood and bacterial suspension and making a smear and staining. A number of fields are counted, comparing the average number of bacteria with the red-blood cells. This suspension of dead bacteria is diluted with normal saline and 25 per cent. carbolic acid to approximate doses.

In order to identify the organism selected, it is necessary for the practitioner to send to the bacteriologist about five cubic centimeters of the patient's blood, withdrawn from a vein into a sterile test-tube or syringe. This should be kept in a cool place and sent within twenty-four hours. The serum from this blood is used for agglutination or complement fixation test against the patient's own organism. The colon group offers obstacles on account of partial absorption of the different saprophytic varieties in the feces. This is the weak point which may be solved later by our necessary friends, the bacteriologists.

In the practical use of the vaccine, however, a means of identification can be demonstrated, and that is called from the clinical stand-point a "reaction." This gives (a) a local effect at the site of injection (anaphylaxis), and (b) constitutional symptoms in some cases, possibly due to an increased endotoxemia, and is partly anaphylactic, as illustrated where the dose is too large.

The local reaction consists of a diffused redness or hyperemia of the skin, extending for from 2 to 5 cm. from the site of injection. This lasts for from one to three days and is followed by induration of this area. The first constitutional symptoms that occur are sensations of nausea and malaise. Severe reactions show increased severity of the nausea and malaise, sometimes vomiting and prostration, chills, and rise of temperature, in one case of the author's as high as 104.5° F. This was after an excessive dose of the patient's autogenous colon vaccine in a case of chronic ulcerative colitis. The patient was ill for three days. Such reactions, while apparently not dangerous, are totally unnecessary and can be avoided by careful observation and moderation in dosage. There is always, in the writer's experience, a period of slight constitutional disturbance for twenty-four hours, followed by considerable relief of the toxemia for three to five days. In other words, the patient's own feelings and relief of symptoms form a guide in treatment.

Besides the subjective symptoms, control may be exercised by repeated blood examinations. The opsonic index in the case of some bacteria, as in the colon group, is ideal but hardly practical on account of the difficulty in technique.

The local symptoms in the disease are helped and cured in time, but it should always be remembered that immunization is only part of the treatment and that any mechanical factors should be carefully attended to, surgically or otherwise. Sepsis from local conditions in the colon or rectum is often markedly improved, as seen in a case of long standing poisoning in an inoperable diverticulitis with an extreme grade of chronic peritoneal adhesions under the writer's observation. A constantly restless, delirious state, uncontrolled by the usual sedative drugs, responded well to the administration of autogenous vaccines of the colon group isolated from the feces.

Mild and severe grades of toxemia from intestinal stasis are often materially aided by properly prepared autogenous vaccines, as evidenced in a number of cases under the writer's observation.

The cases that are very common, and in which every physician should take a lively interest from a bacteriological stand-point, are those of chronic constipation and autotoxemia. In these

cases there is always some underlying cause to be corrected, medically and often surgically. As a rule these people do not consult a physician until the process has gone on for a considerable length of time with poisoning from decomposed matter in the intestinal tract and end products and, what is probably a strong factor, the colon bacillus, which we have seen may become pathogenic when alterations have taken place in the intestinal mucosa. Ulcerations are not uncommon in severe grades of constipation due to various causes of obstruction, ptosis, kinks, and so on, and it is through these ulcerations that the products of decomposition and even bacteria themselves may gain access to the peritoneal cavity, lymphatics, and circulation. In very severe grades of constipation the colon bacillus has been found in blood-cultures. The mind becomes sluggish, and in advanced stages mental aberrations and delirium may occur. The first act of the physician after clearing the bowels is to improve the resistance power of the intestinal mucosa and, to accomplish this, the resistance power of the individual. In addition to the well-known good effects of fresh air and sunshine, immunity by means of vaccines or sera should not be neglected. If an operation is indicated, convalescence will be greatly aided by a course in vaccine therapy. It would be absurd in the face of the matter to inject into the body stock vaccines of bacillary strains unknown to the body, hence the necessity of the aid of an efficient bacteriologist. If the physician has some knowledge of bacteriology, the simple technique of obtaining a culture and preparing vaccine, with or even without control by agglutination or complement, fixation tests can be done. This technique is simple enough to be carried on in an office equipped with an incubator, microscope, and culture media; time, intelligence, and some training in bacteriolgy being the only elements involved. In certain cases, however, nothing but the most expert skill of a bacteriologist will suffice.

It is the practice of the writer of this book to treat with vaccines in this manner his patients both before and after operation; and the practice of the writer of this chapter to make a thorough use of vaccines in the non-operative cases. The results are sometimes astonishing; the possibilities great.

Bacillary dysentery, although not common in the United States, is an example of excellent results of serum and vaccine therapy; in acute cases, serum; in subacute, serum or vaccines. The chief work in this direction has been done by Capt. W. H. C. Foster in the Indian Medical Service. It is indicated in all cases except the most advanced gangrenous and ulcerative types. Different strains of bacilli are used, the principal ones, the Shiga, Flexner, and Y of Hiss. Foster's technique is to give a stock vaccine in small doses at fixed intervals and without control of the opsonic index. Foster cured seven out of ten chronic cases twelve months after treatment. In the Midnapore Gaol, India, the mortality for over six years averaged 6.3 per cent., but after the adoption of Foster's vaccine, it fell to 0.9 per cent.

The *pneumococcus* has been discovered as the apparent cause of colitis. In these cases the organism has been found in the pharynx and feces. Autogenous vaccines have cured some of these. It must not be forgotten that a pneumococcic septicemia or pyemia may exist and the pneumococcus isolated from the blood or from abscesses; in this condition the colitis is a complication.

Primary tuberculous enteritis and colitis may be complicated by bacillus coli infection. In such cases good results have been reported from the combined use of tuberculin T. R. or other and autogenous colon vaccines. Tuberculosis of the bowel when primary should have the benefit of a trial with tuberculin, as cases have been reported much improved and even cured by it.

Streptococci may be largely concerned in colitis or in infections of or around the rectum. These may be identified by cultures taken locally or by agglutination tests with the patient's blood-serum. There is some help here by vaccines, if possible autogenous, or even the serum. Experience has shown, however, but poor results in this line. Staphylococcic infections treated by staphylococcus vaccines will probably show better results.

Diphtheria in the large intestine is an extremely rare occurrence and should be treated by diphtheria antitoxin.

Anaërobic bacterial infections of the colon are little understood on account of the difficulty in studying them. This, field, however, is open for considerable investigation.

Dosage and Administration. — The minimum starting dose of the B. coli vaccine is said to be 5,000,000 bacilli, but from the writer's experience it is better to start with 25,000,000 in order to obtain rapid results. The type of individual has to be considered. The robust patient can, as a rule, tolerate a larger dose than the thin, emaciated one. The dosage is increased by 25,000,000 to 50,000,000 bacilli at a time until 750,000,000 or 1,000,000,000 bacteria is reached, each increase in dose being regulated by the tolerance of the patient. The writer has used as high as 1,000,500,000 in one dose, but considers it unnecessary and inadvisable. The most convenient form in which to keep the vaccine is to have two vials, one containing a suspension of 100,000,000 bacilli to the cubic centimeter and the other 1,000,000,000; this makes it a simple matter to regulate the dose. The vaccines can be kept in an ice-box for about two months, when they slowly deteriorate. The interval between doses is from four to ten days.

In bacillary dysentery the dosage is the same as in colon bacillus infection.

The initial dose of pneumococcus vaccine is from 10,000,000 to 15,000,000 and can be given in doses up to 400,000,000 to 500,000,000 at frequent intervals as close as two days apart. Stock vaccines are of value with this organism, when it is impossible to obtain autogenous ones.

The initial dose of the *streptococcus vaccine* is from 10,000,000 to 50,000,000, and should be increased cautiously up to 400,000,000. In a case of colitis of the writer, where the patient's serum agglutinated the streptococcus, severe reaction occurred after the dosage reached 100,000,000, and 75,000,000 seemed to be the highest amount tolerated.

Staphylococcus vaccines are usually well tolerated and can be given in doses starting at 50,000,000 to 250,000,000 up to 2,000,000,000. The writer has had no experience with these vaccines in this type of intestinal infection, although he has seen excellent results in such conditions elsewhere in the body.

Polyvalent or mixed strains of bacteria are very much like "shotgun prescriptions" and permissible only where guesswork

is legitimate. This is one reason why vaccines in the hands of many have come into disrepute.

Gonococcus vaccines are preferably of stock origin because they are effective, and autogenous ones are difficult to make even for an expert. The dosage begins at about 25,000,000 and is rapidly increased up to 500,000,000 or even 1,000,000,000. It might be tried in rectal infections, but in the writer's experience the only gonorrheal inflammation that has been benefited by it has been acute gonorrheal arthritis, as synovial membranes seem to be easily sensitized by the vaccine.

Typhoid vaccine might be mentioned in the treatment of "typhoid carriers" where the organism is still harbored in the intestinal tract. Excellent results have been reported by the administration of stock typhoid vaccine where a prolonged course of treatment over many months have been carried out. Even then a considerable percentage remain carriers.

The writer wishes to express his gratitude to Drs. William H. Park, Albert G. Bennett and Krumweide for their valuable assistance in the preparation of this chapter.

X-RAY EXAMINATION OF THE INTESTINE.

THE x-ray examination of the bowel is made by using a material opaque to the x-rays, administered by mouth or as an enema, following which observations are made with the fluoroscope and records taken with the Röntgenograph at such intervals as will permit inspection of the parts most commonly involved in abnormal conditions, and at the same time prevent overlooking other departures from the normal. A simple outline of the procedure as followed by the writer is here given.

FIG. 186
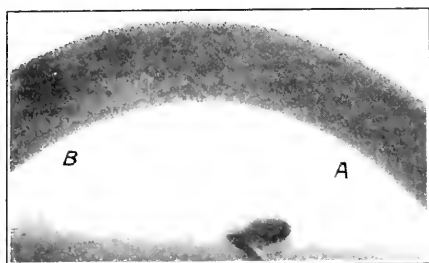
FIGS. 186 to 189.—Represent a rubber tube which had been radiographed while bismuth was forced through it under pressure; the flow is from A to B. Fig. 186 illustrates the tube slightly curved without any change in diameter.

Bismuth subcarbonate is administered in a suspension consisting of 120 to 190 grams of the bismuth salt; and 2 grams of powdered acacia added to 500 c.c. of water; sugar of milk or syrup and vanilla may be added. In the normal case or the case that is nearly normal, inspections are made at the sixth, eighth, ninth, thirtieth, fifty-fourth, and seventy-eighth hours; departures from this schedule are made as indicated. Stasis may be very much prolonged at any portion of the bowel; its location will determine the time for additional examinations or changes in

Fig. 187
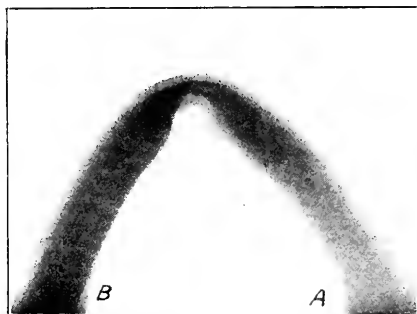
Exhibits a greater degree of curvature with traction in the middle partly constricting the tube, but yet permitting the bismuth to pass through.

Fig. 188
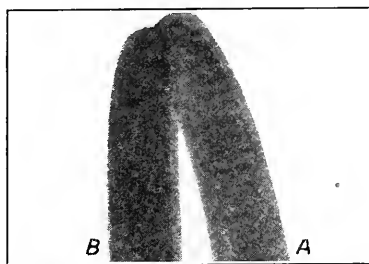
The plane of projection is slightly oblique; therefore we get a foreshortened shadow which will illustrate what may occur when radiographing one of these acute angles in the intestine, and so must make our deductions with allowance for this deformity of image. Greater traction has been applied, resulting in bending the tube and producing an acute angle, which has obliterated the canal and stopped the flow of bismuth emulsion.

Fig. 189
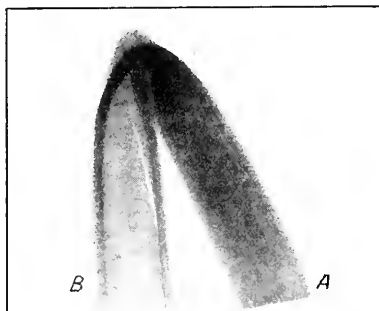
Illustrates one arm of the acutely flexed tube full of bismuth emulsion under pressure, while the contents of the other arm have flowed out and not left sufficient residue to cast a shadow. The action of the bismuth in this tube illustrates what occurs when the intestine is bent at an acute angle at the attachment of a supporting ligament.

the periods. The normal patient will evacuate the entire meal in thirty hours, or leave such small quantities in the sigmoid and rectum as not to be worthy of consideration. About 50 per cent. of the cases will continue to the fifty-fourth hour and

Fig. 190
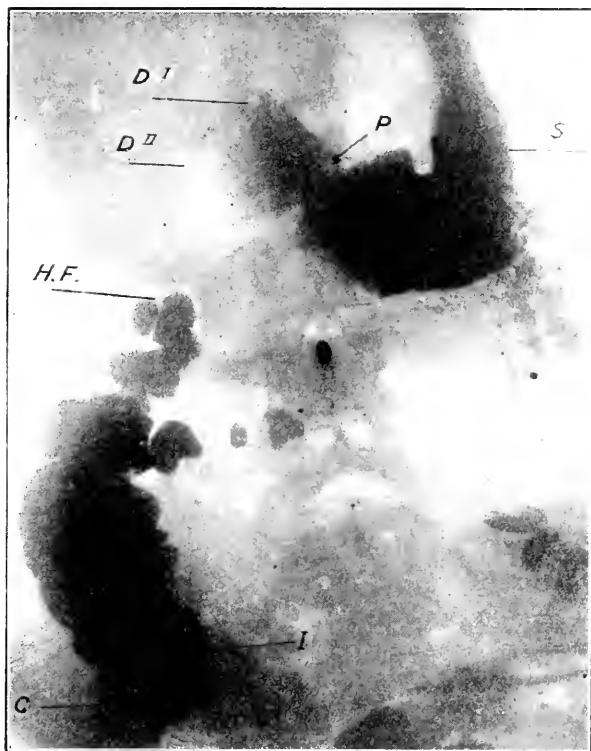
Service of Dr. S. L. Cash. Angulation of the duodenum at the juncture of the first and second portion. The gastric delay was twelve hours. In this Röntgenograph it will be noticed that the pylorus readily permits the gastric contents to pass into the duodenum; while the second portion of the duodenum has a small quantity of bismuth within it. Delay also occurs at the hepatic flexure, due to adhesions between the ascending and transverse colon.

30 per cent. to the seventy-eighth hour. The remaining 20 per cent. will cover the normal cases and cases of extreme stasis.

The enema used consists of 100 grams of bismuth subcarbonate or barium sulphate in a suspension consisting of powdered acacia 4 grams, and water 1500 c.c. During the administration

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of this enema, the progress up the colon may be observed with
the fluoroscope; the points of delay, constriction, and dilatation
are inspected.   The rapidity with which it reaches the flexures

Fig. 191
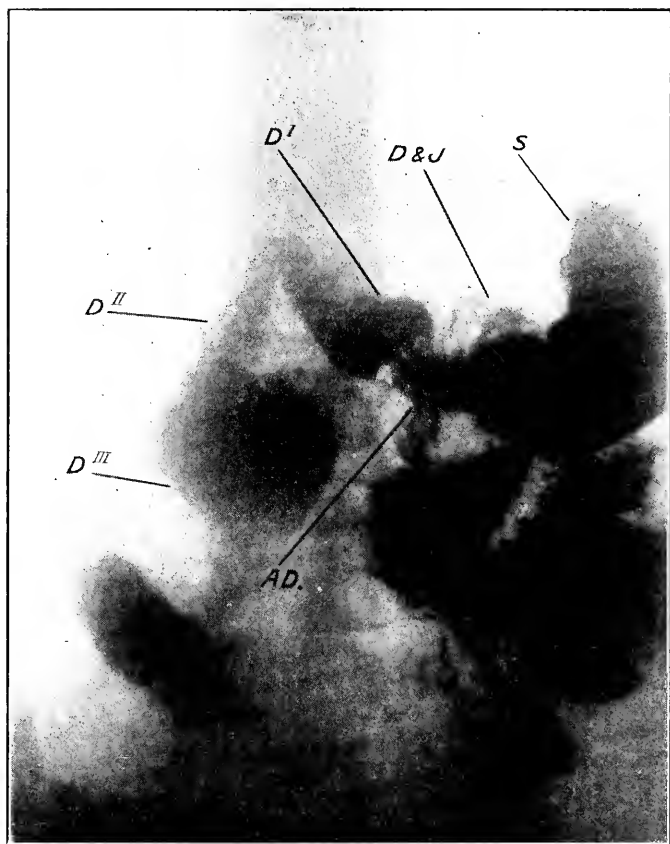
Miss K.   Referred by Dr. Maurice Packard.   S, stomach; D^1, first portion of
duodenum; D^{11}, second portion of duodenum; D^{111}, third portion of duodenum; DJ,
juncture of duodenum with the jejunum.   This is dilatation of the duodenum,
most pronounced in the first half of its third portion, and is the result of adhesions
in the distal end of the duodenum.   The Röntgenograph was taken eight hours
after the administration of the meal.

and enters the cecum may be observed, and its further progress
through a patulous ileocecal valve can be determined.   It is
preferable to administer the enema with the patient supine.

When in this position the abdomen may be manipulated, and, if the head of the enema column becomes stationary from angulation or constriction, the point can be observed by aid of the hand and may be induced to pass onward. If the enema is administered when the patient is erect, some difficulty may be experienced in overcoming gravity and also in passing the flexures. In addition, the massing together of the intestines that are ptosed, and

Fig. 192
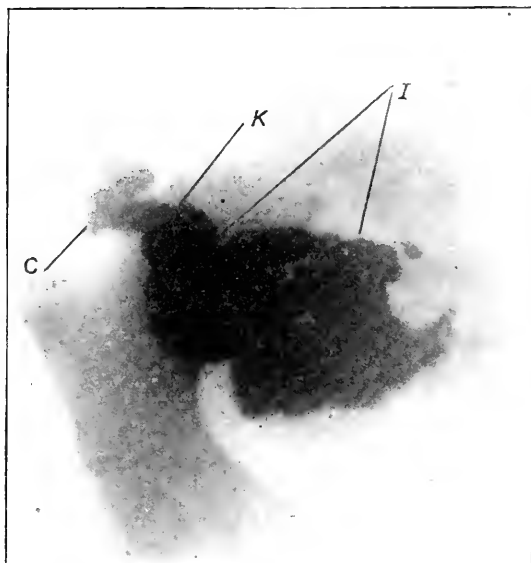
I, ileum; *K*, ileal kink. This kink is of the organic type, inasmuch as the changes that have occurred in the wall of the ileum have permanently decreased its caliber. This is secondary to the mechanical kink from the contracted mesentery. It will be observed that but a small portion of the bismuth has entered the cecum, and that the entire amount of the meal at the end of six hours is accumulated in the ileum.

the rigidity of the abdominal walls, prevent manipulation of the coils of the intestines and overlying segments, and prohibit inspection of some of the most important points at which lesions occur.

The accompanying plates, with description, will serve to explain many of the characteristics observed under the fluoroscope. An explanation of the mechanics of uncomplicated mechanical obstructions that occur as the result of the various fixation points

that exist where normal suspensory ligaments together with adventitious bands are formed, may best be illustrated by referring to Fig. 186. In this a piece of rubber tubing containing an opaque salt has been radiographed while suspended, and various curves, kinks, and angles produced while the bismuth suspension is under pressure. It will be seen by comparing the hollow in-

FIG. 193
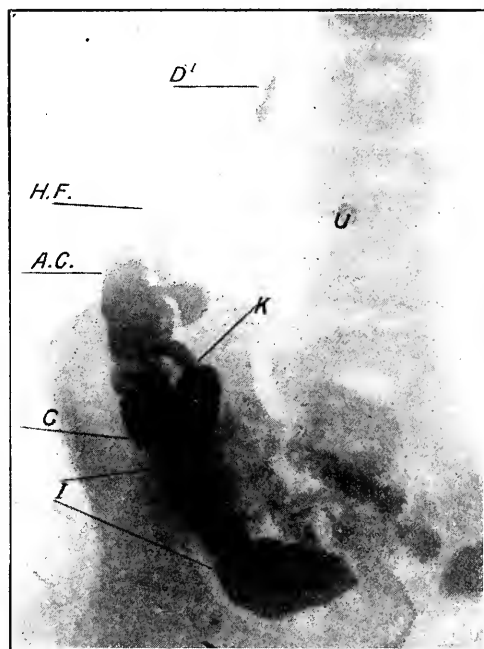
Service of Dr. Edward L. Kellog. *I*, ileum; *C*, cecum; *A.C.*, ascending colon; *K*, kink. This is the six-hour progress of a bismuth meal. The terminal ileum is constricted as a result of organic changes within its walls at the point where the contracted mesentery has produced an acute angle. The terminal ileum and cecum are bound by adhesions.

testine to this rubber tubing that the same mechanical principles will cause like conditions to arise where a supporting ligament suspends the intestine at one point and permits the two arms of the adjacent sections to drop downward, so that we have a like obstruction produced. The ascending and descending mesocolon, together with the pleurocolic ligament at the splenic flexure, and adventitious mesenteric and peritoneal bands, are

the usual supports found maintaining the colon at its points of fixation. We frequently see the shortest sections of the mesocolon

Fig. 194
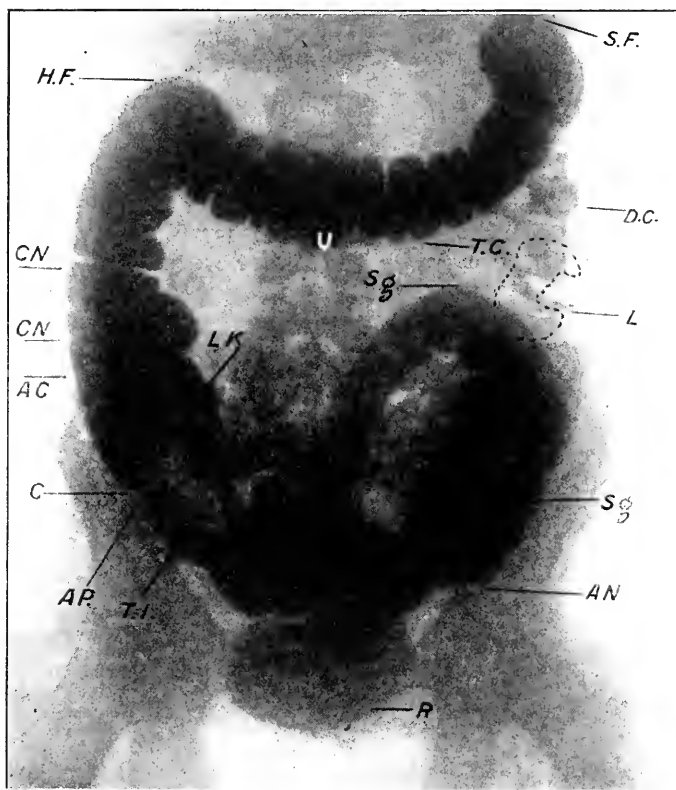
T.I., terminal ileum; LK, Lane kink; C, cecum; AC, ascending colon; CN, constriction. H.F., hepatic flexure; T.C., transverse colon; S.F., splenic flexure; D.C., descending colon; L, loop; AN, angulation; Sg, sigmoid. Objectively, the terminal ileum would appear normal, but manipulation at the point marked LK. demonstrates fixation, proving the existence of the simple mechanical ileal kink. The ileocecal valve is patulous, the enema having passed through it. The constrictions on the ascending colon are the result of mesenteric bands. The entire mesocolon at this point was short. On the descending colon there is a loop which lay in such a position when the patient was horizontal that but a small quantity of bismuth remained in it. The pelvic sigmoid consists of a long loop which leaves the iliac portion at an acute angle.

about half-way up the ascending colon, also just below the splenic flexure. When we have this condition, the hepatic and splenic flexures may have a long mesocolon, permitting these to drop

downward and forward when the patient is erect.   The apex of
this angle is at the highest point of the mesocolon.

The first point at which there is mechanical obstruction in the
intestinal tract, very frequently of the simple type, but often
combined with organic changes, is at the juncture of the first

FIG. 195
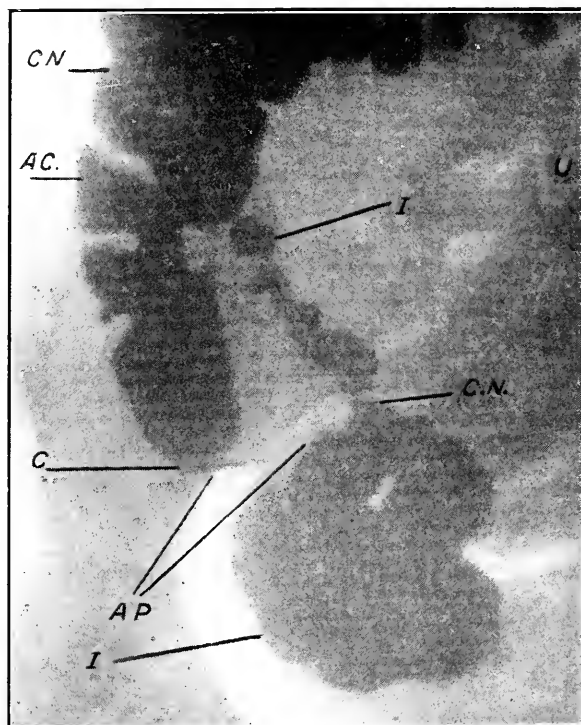
I, ileum; *CN*, constriction; *C*, cecum; *AC.*, ascending colon.   This is an eight-
hour stasis in the ileum, and is the result of a contraction about 8 cm. below the
ileocecal valve where the appendix is adherent to the ileum; but a portion of the
shaft of the appendix can be seen extending inward from the cecum.   The remainder
could be easily palpated.

and second portion of the duodenum, or the apex of the conus
duodenalis.   It has been my observation that more cases of
gastric delay occur as a sequela of this obstruction than from
all other causes combined.   This may sound like a rash statement,
but if we consider the evidence as we find it in these subjects,
when thoroughly examined in both the vertical and horizontal

positions under different conditions, there is ample proof of the truth of this. More than 50 per cent. of cases with gastric delay have been observed to have a normal hypermotility amply sufficient to carry the stomach contents up into the conus duodenalis. The stomach may be ptosed so that it lies at the brim of the pelvis, and if observed over a suitable period will be found equal to the task of elevating its contents to a sufficiently high level

Fig. 196
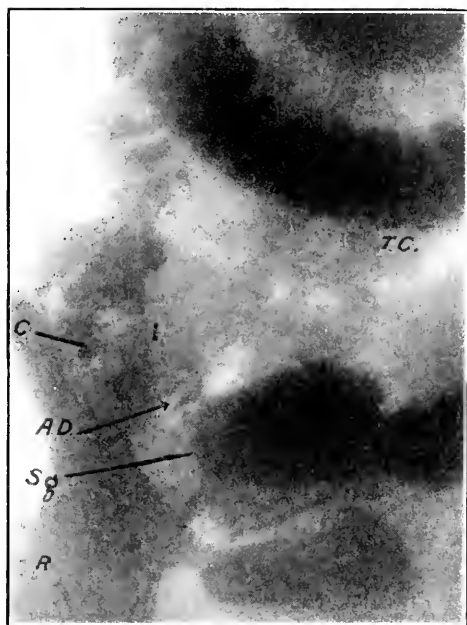
Service of Dr. E. L. Kellog. *Ap*, appendix; *Sg*, sigmoid; *C*, cecum. The tip of this appendix is adherent to the sigmoid. The shaft could be readily moved about independent of the sigmoid shadow while the tip remained stationary or moved with the sigmoid.

to pass it through the pylorus and fill the first portion of the duodenum, but if carefully inspected when this occurs it will be seen that but a very small amount, if any, has passed into the second portion of the duodenum. Place this patient in a horizontal position and the contents of the stomach are rapidly discharged, and within the normal period the stomach will be emptied. This is an important point in the diagnosis of the various causes of

the gastric delay, and one that has been overlooked by many. Occasionally there will be observed a stomach in which gastric atony is a sequel of this mechanical obstruction. All these cases appear to respond sufficiently to a favorable position to permit the stomach contents to pass onward. Such organic

Fig. 197
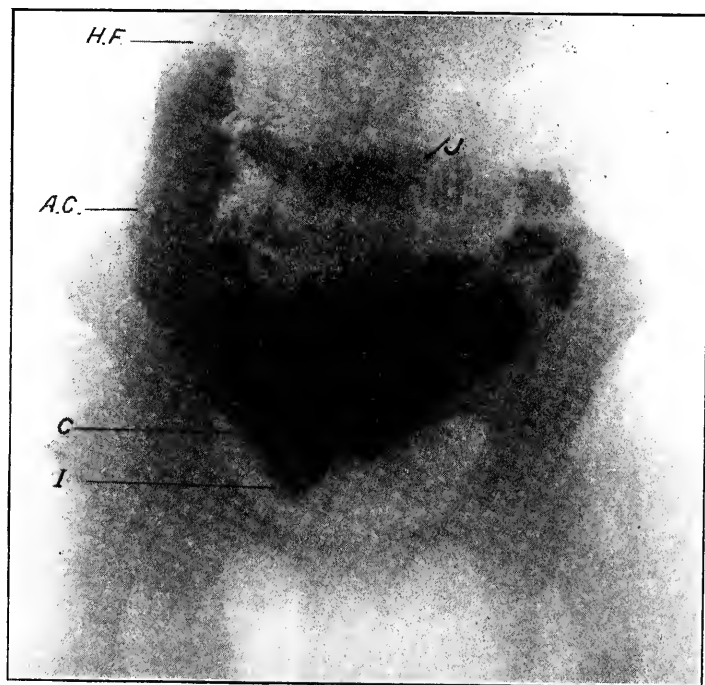
This cut and the four following illustrate five stages in the progress of a bismuth meal. The hours were modified in the last two days of the examination because of the inconvenience of travel to the office, otherwise the tests were made in the usual routine. *I*, ileum; *C*, cecum; *A.C.*, ascending colon; *H.F.*, hepatic flexure. This Röntgenograph was taken six hours after the administration of the meal. The head of the bismuth column is at the hepatic flexure; there is a collection in the lower ileum, and a small quantity at the lower end of the jejunum, marked *J*.

changes may occur at the first and second portions of the duodenum as to produce a stenosis that cannot be overcome by the aid of position-drainage.

The next point at which simple mechanical obstruction or that combined with organic changes occurs is at the juncture of

the third portion of the duodenum with the jejunum. This results in dilatation of the second and third portions of the duodenum. The difficulty of demonstrating this on the radiograph is great because of the position of this flexure of the small bowel. In some cases it appears above the lesser curvature of the stomach and may be seen, but in many cases it rests behind the stomach

Fig. 198
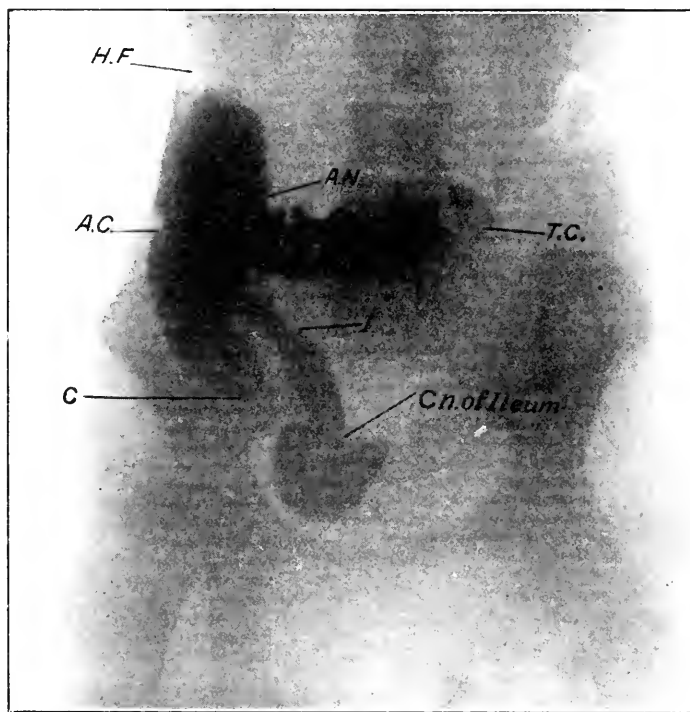
I, ileum; C, cecum; A.C., ascending colon; H.F., hepatic flexure; T.C., transverse colon. Taken at the eighth hour. A constriction in the terminal ileum is where the appendix is attached. The head of the bismuth column was in the left transverse colon.

and is overshadowed by the stomach contents; to inspect it requires prolonged observation, such as can only be made under ideal conditions. As a rule, in these cases, the duodenal suspensory ligament of Treitz is contracted, and adventitious bands are found aiding this ligament in its endeavor to support the intestine, these all tend to retract the duodenum to the left,

drawing it up behind the stomach, and may render the inspection of the second portion of the duodenum difficult unless the stomach is pushed to the left or the patient is rotated.   Some of the Röntgenographs here exhibited demonstrate this as seen in favorable cases.

Fig. 199
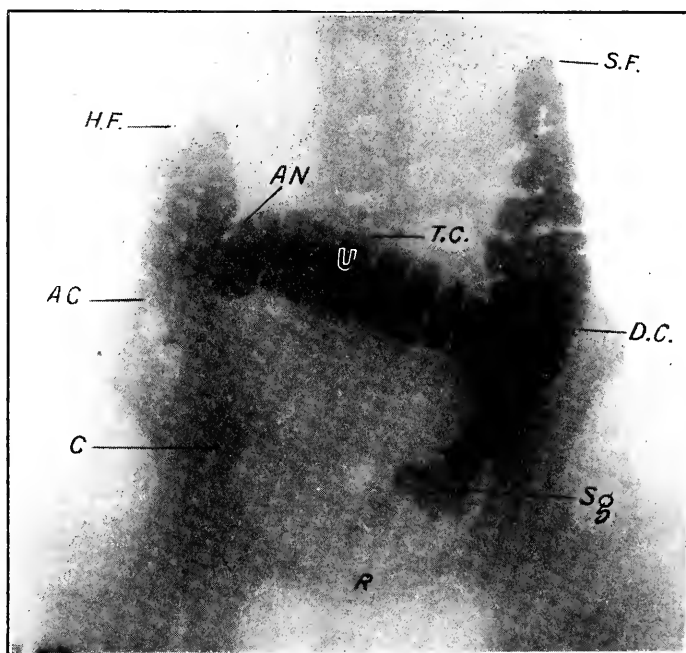
C, cecum; AC, ascending colon; H.F., hepatic flexure; AN, angulation; T.C., transverse colon; S.F., splenic flexure; D.C., descending colon; Sg, sigmoid. The head of the bismuth column has been evacuated. The cecum has a few small fragments.   The ascending colon has a small amount rendered dilute by food taken at later meals. The greater portion of the bismuth is in the transverse colon, and there was a large amount in the descending colon and iliac sigmoid, with one or two fragments in the pelvic sigmoid.

As the intestinal contents pass downward through the jejunum they rarely meet with obstruction unless due to causes originating outside this section of the bowel. The almost incredible speed with which the jejunal contents pass onward in the normal subject is a phenomenon which is well worth observing. As the duodenum discharges its contents into the jejunum the peristalsis appears to gather added force to carry the chyle forward on its route

through the ileum, and as it twists and turns back and forth,
now to the front and across the abdomen and back again, or
upward and downward, looping first in one direction and then in
another, one is reminded of the dipping, twisting, and turning of
the scenic railway, if we may use such a comparison. The material

Fig. 200
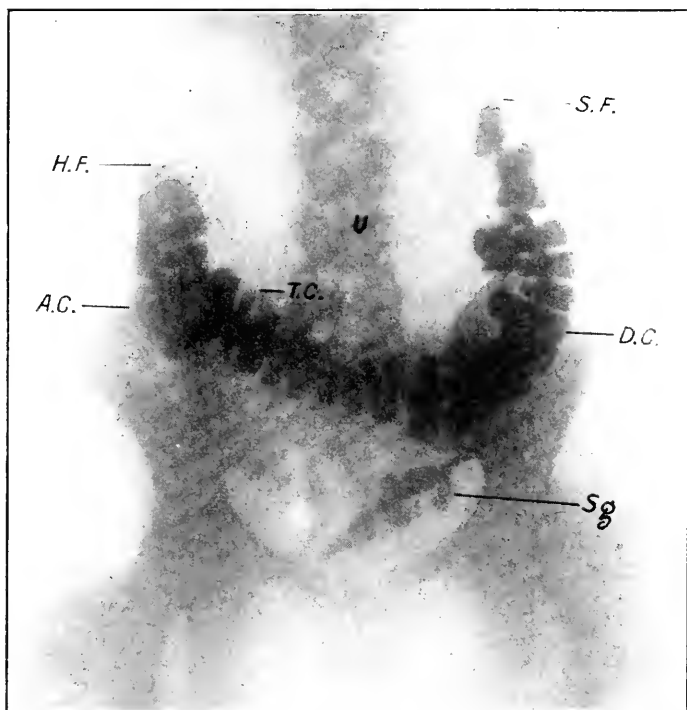
A.C., ascending colon; H.F., hepatic flexure; D.C., descending colon; T.C.,
transverse colon; S.F., splenic flexure; D.C., descending colon; Sg, sigmoid. Taken
at the sixtieth hour after ingestion. Another evacuation has occurred. The
cecum and lower half of the ascending colon are clear. Bismuth remains in the
upper half of the ascending colon, the transverse and descending colon, and there
are fragments in the sigmoid.

is gathered together in a bolus the size of the diameter of the
intestine, its length about twice its width, and flocculent in
appearance; this is carried through the jejunum until it rests
in the upper portion of the ileum, within a period that I estimate
to be about five minutes for the minimum up to fifteen or twenty

minutes for the maximum. After reaching the ileum it masses together in more solid form, lying principally in the left and lower portion of the abdomen. The progress through the ileum varies exceedingly, as it is apparently lying at times for hours high up in its coils, or at other times rapidly descending to the lowermost section, going upward to the cecum. If the patient has been

Fig. 201
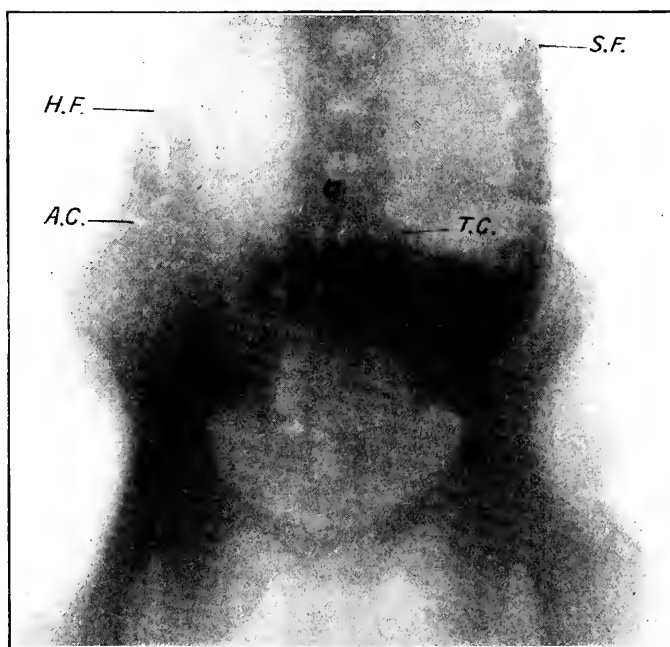
A.C., ascending colon; H.F., hepatic flexure; T.C., transverse colon; S.F., splenic flexure. The Röntgenograph was taken eighty-six hours after administration of the meal. There has been further evacuation; there are fragments in the upper ascending colon and right transverse colon. There is a large residue in the left transverse colon. The descending colon and sigmoid are clear. This case has interference at the splenic flexure, the result of an acute angle.

taking laxatives, cathartics, or oils, the speed is greatly increased, and a flocculent appearance is observed in the jejunum and may continue almost to the terminal ileum.

The terminal ileum normally presents the appearance of a slightly curved tube ascending upward into the inner side of the cecum. If conditions are properly arranged, the leaf-like

projections of ileocecal valve may be defined between the bismuth within the ileum and that contained within the colon.   When the cecum is not resting within the pelvis the terminal ileum, or that portion extending from the last coil to the cecum, is from

Fig. 202
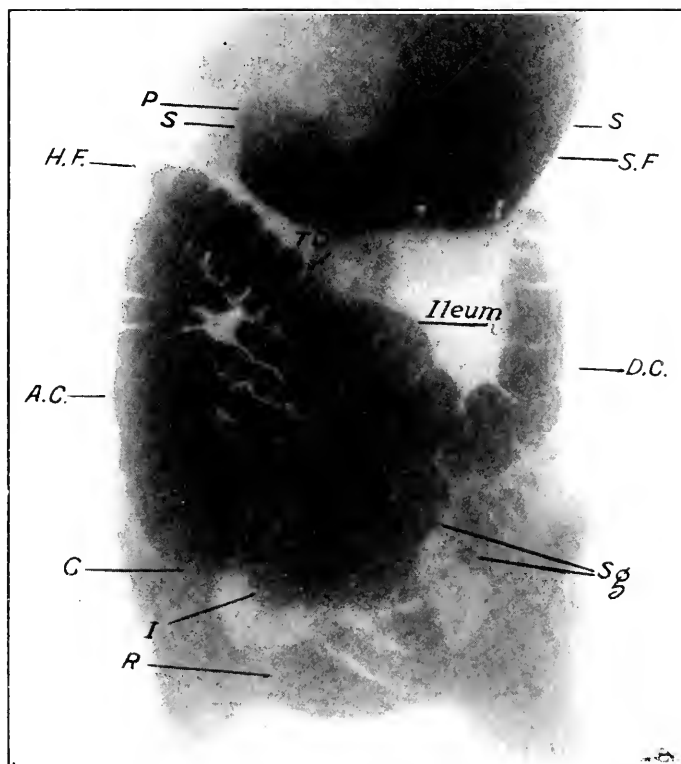
I, ileum; C, cecum; A.C., ascending colon; H.F., hepatic flexure; TC, transverse colon; S, stomach; S.F., splenic flexure; D.C., descending colon; Sg, sigmoid. This Röntgenograph follows the administration of the bismuth meal and enema The enema has passed through the ileocecal valve and progressed upward through numerous coils of the ileum, the highest one of which appears above the transverse colon.   The case gave a history of severe headaches occurring over a period of a number of years. So many of the coils of the ileum are filled that it is impossible to distinguish them.

5 cm. to 15 cm. in length, depending on the height of the cecum and the level of the lowermost coils of the ileum.

As observed under the x-ray, the diameter of the terminal ileum varies greatly, the normal casting a shadow of about 1.5

cm. in diameter. Where obstruction exists, it may be dilated
to the diameter of the colon. Adhesions frequently involve this
portion; of these the Jackson membrane, adherent appendix,
and pelvic inflammations are the most common source. An ileal

FIG. 203
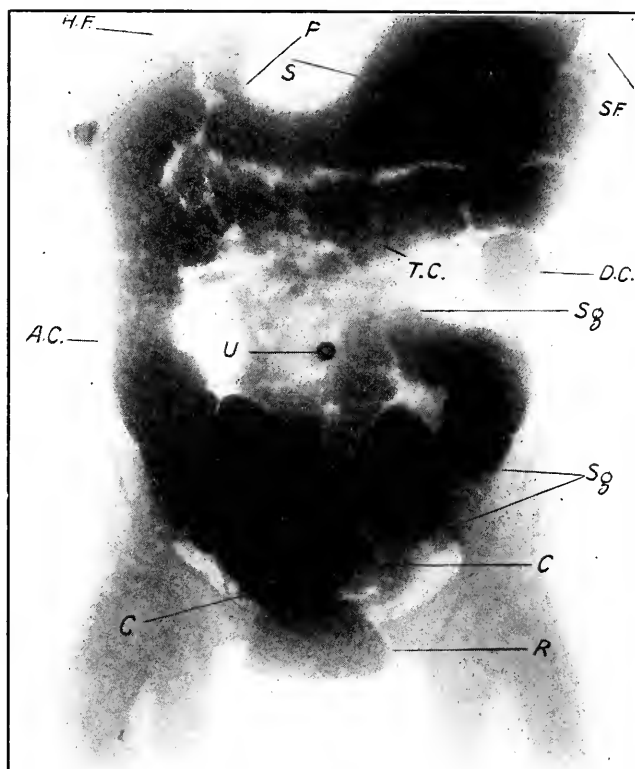
C, cecum, A.C., ascending colon; Sg, sigmoid. This illustrates how a large
cecum may become lodged in the pelvis, enormously distended, so interfering
with the function of the sigmoid as well as producing pronounced ileal and cecal
stasis. In this case the sigmoid is crowded to the left and upward. This cecum
could not be dislodged from the pelvis during the examination.

or Lane kink cannot be classed among adhesions of the ileum as
it is a lesion of the ileal mesentery, although it may eventually
result in the formation of inflammatory bands around the ileum.
These are secondary to the ileal kink produced by the contracting
mesentery.

Inspection of the terminal ileum under the fluoroscope is best made at the time when there is only sufficient bismuth within the lower ileum to outline the terminal portion, in order that

Fig. 204
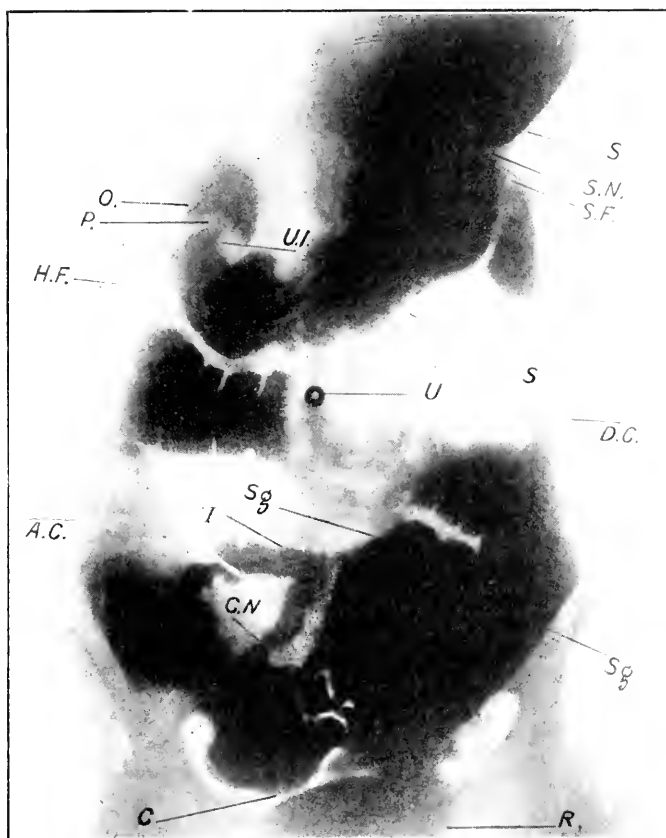
C, cecum; A.C., ascending colon; Sg, sigmoid.   The cecum rests in the pelvis. This patient was very thin, and a prominent pelvic brim indented the outer posterior wall of the colon.   It will be observed that the enema has passed into the ileum, the terminal portion of which can be readily seen ascending between the sigmoid and ascending colon.   This case had very little ileal stasis, which can be accounted for by the relative position of the ileum and cecum, and the fact that there was no pronounced organic interference in the ileum.   This permitted the contents of the ileum to readily flow into the cecum when the patient was erect.

the entire amount may not pass into the cecum earlier than anticipated.   Differentiation of the various abnormalities in the terminal ileum can only be made by careful inspection and

palpation of the ileum while the bismuth is contained within it. Its degree of fixation, direction of its axis, permanent deformities, and peristalsis, are determining factors in the diagnosis.

Fig. 205
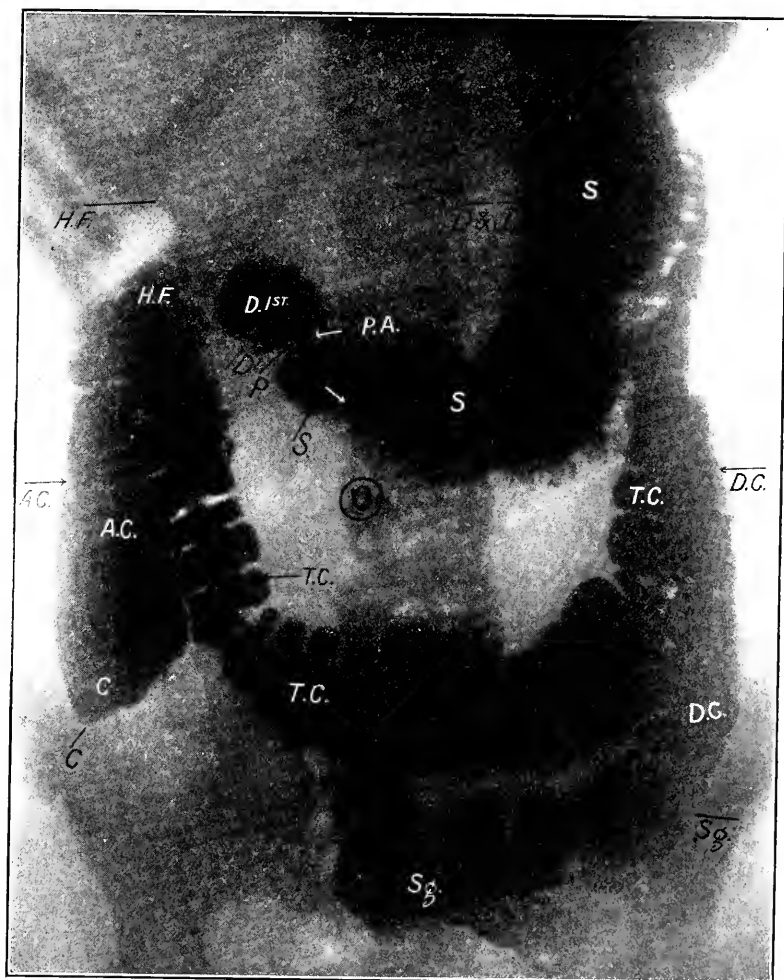
C, cecum; A.C., ascending colon; T.C., transverse colon; S, stomach. This is taken following the administration of a meal and enema. The patient had a gastric ulcer and adhesions between the ascending and transverse colon. It will be seen that the parts are so tightly adhered that their surfaces are moulded one to the other.

The ileocecal valve may be inspected following the administration of a meal, but its competency is best determined by an enema. A large number of cases with dilated cecum have a patulus ileocecal valve, and the enema will pass through in large quantity. Enough may ascend into the ileum to outline numerous coils.

FIG. 206
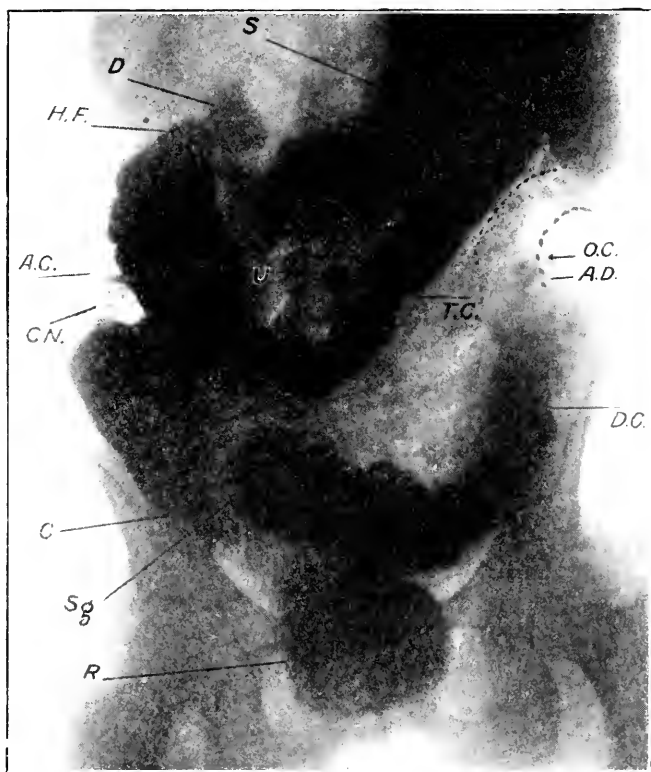
C, cecum; A.C., ascending colon; C.N., constriction; H.F., hepatic flexure; T.C., transverse colon; D.C., descending colon. There is a constriction on the ascending colon, the result of a contracted mesentery, and on the descending colon adhesions retract it inward. The sigmoid consists of a moderately long loop lying transverse above the pelvic brim.

In diagnosing ileal kink, no dependence should be placed on a constriction in the terminal ileum, unless thorough palpation under the fluoroscope has proved it to be an unyielding obstruction; but the absence of obstruction or a constriction or angle in the

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ileum does not prove the absence of a typical ileal or Lane kink. When there is marked deformity or a permanent constriction there is usually an organic change within the ileum itself. This may be the sequela of an ileal kink, but may be due to other

FIG. 207
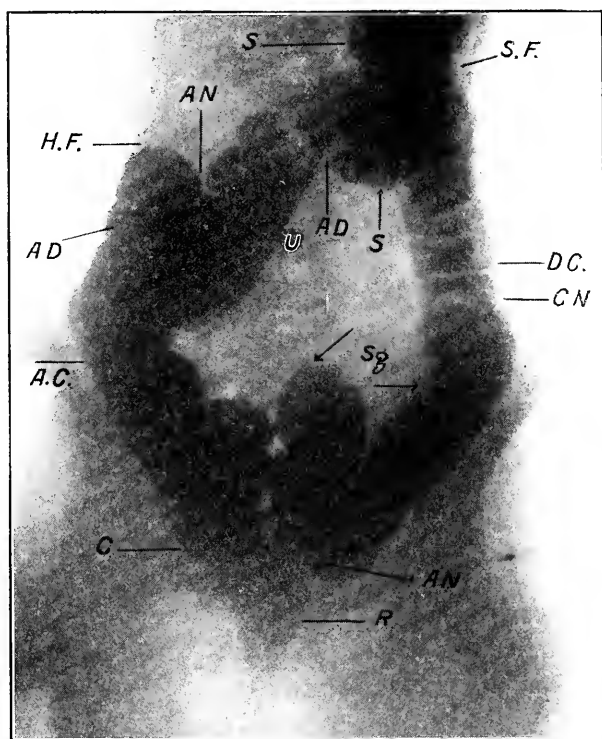
C, cecum; A.C., ascending colon; AD, adhesions; H.F., hepatic flexure; AN, angulation; S, stomach; S.F., splenic flexure; DC., descending colon; CN, constriction; Sg, sigmoid; R, rectum. This large cecum rests in the pelvis, crowding the sigmoid to the left, which accentuates the angulation at the sigmoid at the juncture of the iliac and pelvic portion. There are adhesions between the two arms of the hepatic angle. Also adhesions hold the middle of the transverse colon up behind the stomach, which can be seen hanging down over it. This results in an angulation in the right transverse colon. On the descending colon just above the iliac crest there is a constriction, the result of a contracted mesocolon.

causes. Another obstructive condition occurring in the terminal ileum is a twist which is the result of the downward and inward rotation of the cecum when the patient is erect. This is usually associated with ileal kink. The inward rotation of the cecum is

the result of the downward and inward slope of the abdominal wall posterior to it.

The degree of delay in the lower ileum is determined by the manner in which the bismuth accumulates at this point, as well as the advance in the ascending colon and the delay in the

FIG. 208
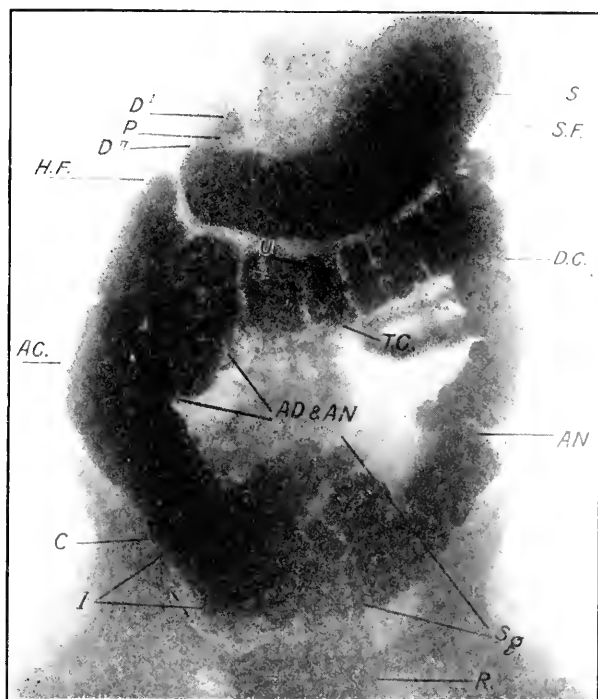
C, cecum; AC., ascending colon; H.F., hepatic flexure; T.C., transverse colon; D.C., descending colon. Adhesions bind the two limbs of the hepatic angle, also the two limbs of the angle in the right transverse colon, producing a reverse acute angulation. On the descending colon another angle is formed. This latter is the type which if viewed in the other plane would appear as a constriction.

stomach. Pronounced gastric delay results in a false reading of the ileal delay; therefore we should take into consideration several factors in determining ileal stasis.

If the stomach empties at the normal period of four and a half hours following the administration of bismuth, the ileum should be empty at six hours. Gastric delay means a corresponding

lengthening of the time of ileal discharge.   When bismuth is
used the time periods are for a bismuth reading.   These do not
correspond with the readings when food or other material has been
administered.

FIG. 209
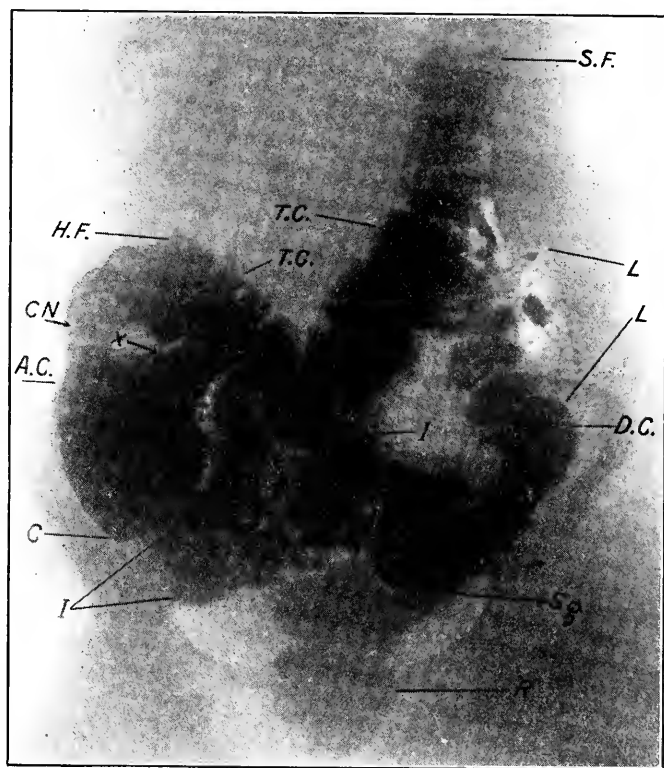
Service of Dr. Eichorn.   *I*, ileum; *C*, cecum; *A.C.*, ascending colon; *CN*, con-
striction; *H.F.*, hepatic flexure; *T.C.*, transverse colon; *D.C.*, descending colon;
L, loop; *Sg*, sigmoid.   The ileum is seen to be very much distended; its diameter
is as great as portions of the sigmoid.   Adhesions involve the ileum and bind the
ascending and transverse colon.   At the time the Röntgenograph was taken the
transverse colon was retracted upward, pulling on the inner side of the descending
colon, with the result that we have what appears as a projection between the
ascending and transverse colon, marked *X*.   On the descending colon there is a
loop.

A very good index of ileal stasis is accumulation of gas in the
ileum; this is frequently observed even when examinations
are made for other conditions.   Radiograph No. 227 illustrates

this condition in a child which had all the radiographic evidence of a congenital ileal kink.

The cecum is a portion of the intestine that is subject to great variations in size, shape, and position. While commonly found in the right iliac fossa, under normal conditions 2 cm. below the level of the line drawn from the anterior superior spine to the umbilicus, in a very great percentage of cases examined it is lower than this.

Fig. 210
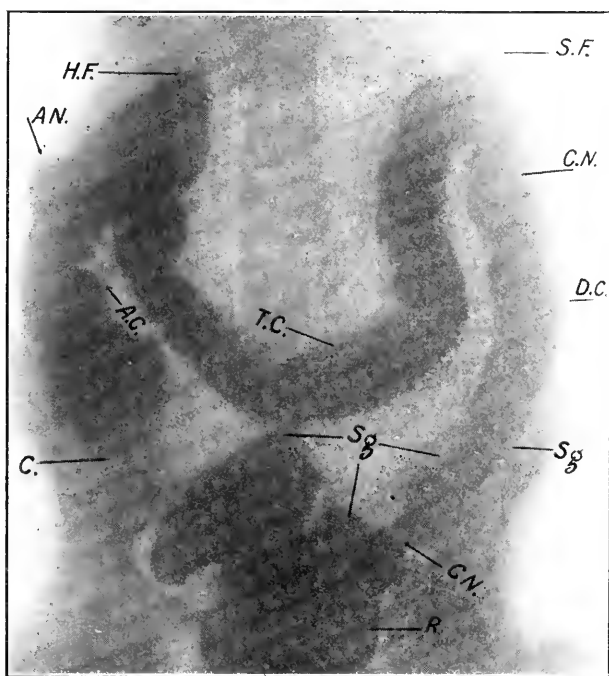
C., cecum; A.C., ascending colon; A.N., angulation; H.F., hepatic flexure; T.C., transverse colon; S.F., splenic flexure; C.N., constriction; D.C., descending colon; Sg, sigmoid. In the upper part of the ascending colon an angulation is formed when the hepatic flexure drops downward and inward; this is the result of a contracted mesocolon. There is a constriction on the descending colon, which is the point where we frequently find mesenteric bands. A like condition exists in the sigmoid at the pelvic brim.

The diameter of the cecum and ascending colon is always greater than that of the descending colon, provided dilatation exists in both at once. We may find the cecum and ascending

colon contracted, following the discharge of their contents, and at the same time see the descending colon dilate with the material that has recently entered it; this is frequently seen following the administration of the enema; therefore, a reading of the cecum

FIG. 211
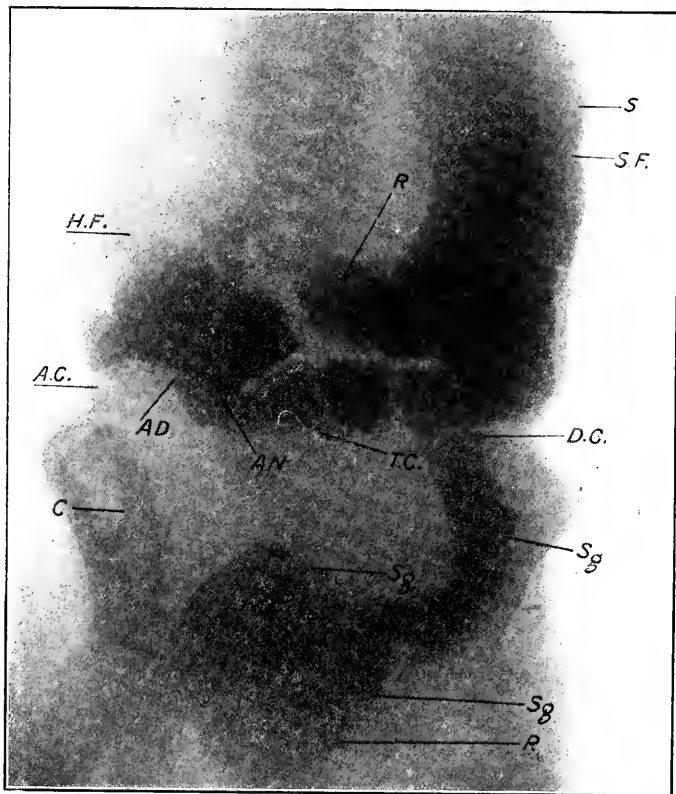
H.F., hepatic flexure; T.C., transverse colon; AN, angulation; AD, adhesions. Adhesions have deformed the right hepatic colon, and there is pronounced obstruction where the enema will not pass into the ascending colon.

and ascending colon can only be made while fully dilated, immediately following the administration of an enema which has entirely filled both of them.

The determination of the appendix is usually dependent on the position of the cecum, its mobility, and the relaxation of the walls

of the abdomen which will permit elevating the cecum to place the
meso-appendix on a stretch.[1]

Fig. 212
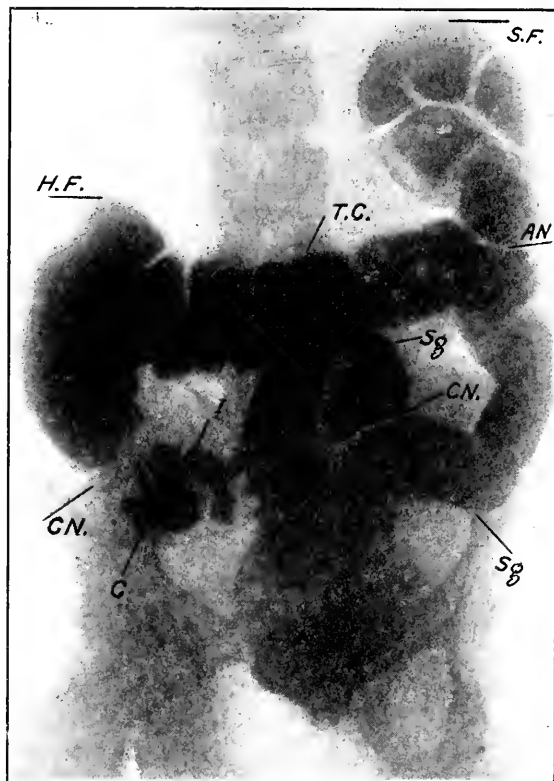
Service of Dr. Manning. C, cecum; I, ileum; C.N., constriction: A C., ascending
colon; H.F., hepatic flexure; T.C., transverse colon; S.F., splenic flexure; AN,
angulation; D.C., descending colon; Sg, sigmoid; R, rectum.   This follows the
administration of an enema, a small quantity of which has entered the ileum.
There is a constriction just above the cecum which offers pronounced inter-
ference.   This is a common location for mesenteric bands. An angulation in the
left transverse colon is of the static type.   The sigmoid is very much deformed
and involved in adhesions, the principal one forming a band.

Röntgenographically we may divide the appendix into classes.
These classes are based on an analysis of the interpretation of
shadows seen by the fluoroscope and on the Röntgenograph.

[1] See the New York Medical Journal, October 11, 1913. "Differential Diagnosis
of the Appendix by Aid of the Röntgen Ray."   By A. J. Quimby, M.D.

(1) Functionating or non-functionating; (2) Fixed or movable; (3) Ascending, descending, and transverse; (4) Straight, curved, looped, and clubbed.

Fig. 213
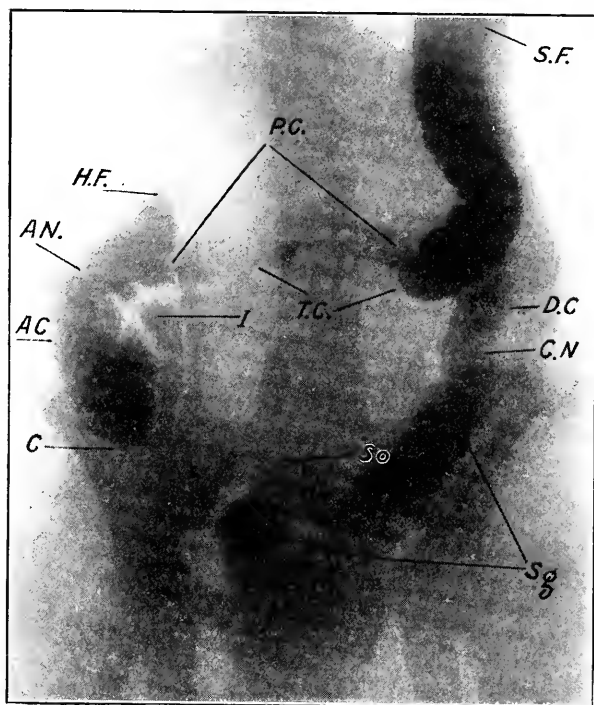
C, cecum; AC, ascending colon; AN., angulation; T.C., transverse colon; P.C., peristaltic contraction; D.C., descending colon; C.N., constriction; Sg. sigmoid. The angulation on the ascending colon is produced by the downward and inward drop of the hepatic flexure, causing tension on the contracted descending mesocolon. There is a static angulation in the right transverse colon. It will be observed that the peristaltic wave begins at the angulation in the right transverse colon, and has progressed to the left transverse colon. This illustrates the fact that peristalsis starts beyond the point of obstruction, even if of a very minor degree.

The functionating appendix is one that is capable of receiving and discharging bowel contents. A non-functionating appendix is one which is incapable of keeping itself clean or of emptying out the feces that may enter it at intervals synchronous with the discharge of the cecal contents. An appendix may retain material which has entered it over a few days; this is usually due to a chronic

inflammatory process having injured its muscular coat. This type of appendix may also be incapable of receiving material because of obliteration of its canal.

Fig. 214
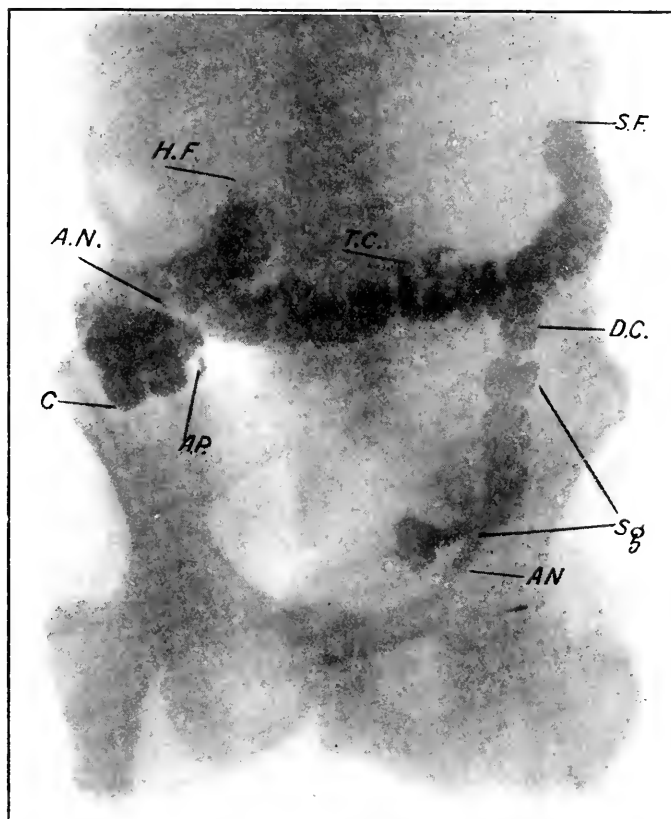
C, cecum; AP., appendix; A.N., angulation; H.F., hepatic flexure; T.C., transverse colon; D.C., descending colon; Sg, sigmoid. This was taken thirty hours after the bismuth meal. It illustrates the effect on the ascending colon when the hepatic angle drops downward and inward, and produces traction on the ascending mesocolon. The angulation in the sigmoid is at the pelvic brim, a common location for mesenteric bands.

The fixed appendix is usually adherent to the abdominal wall or to adjacent structures which are so tightly bound by adhesions as to be immovable. The movable appendix can be entirely free from adhesions or adherent to other movable viscera.

The third class refers to the position in which the appendix may lie when the patient is horizontal, and serves to designate the general direction in which the surgeon should be able to locate it if concealed in a mass of adhesions. The fourth class

Fig. 215
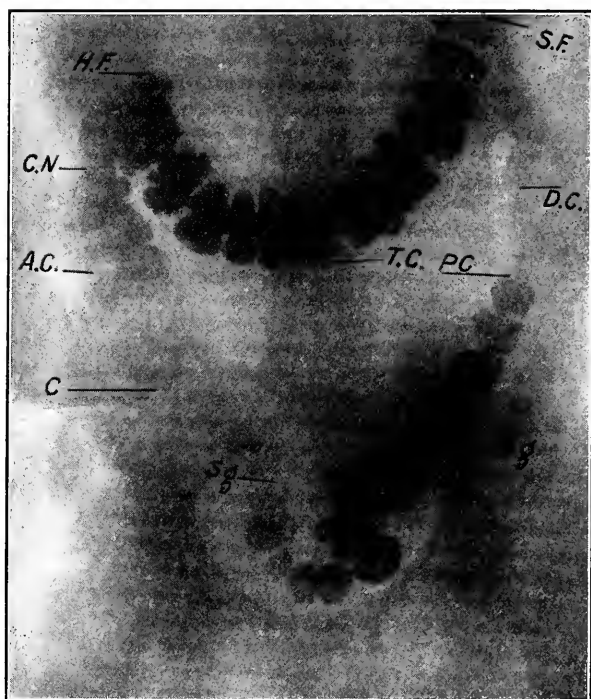
T.C., transverse colon; D.C., descending colon. On the descending colon the active normal peristalsis is occurring, carrying the bismuth downward into the sigmoid. This Röntgenograph was taken ninety-six hours after the administration of the meal. There is interference at the splenic flexure, which results in tension of the transverse colon, and in the peristalsis starting just below the splenic flexure.

applies to the general shape of the appendix itself. The retro-cecal appendix can frequently be located just after the cecum has discharged all its bismuth, leaving the concealed appendix exposed with retained bismuth.

Where the cecum lies in the pelvis it is difficult to make a determination of the condition of the appendix because of the inability to expose it clear of other shadows or to palpate it.

The deformities of the colon can be broadly classified into angulations, constrictions, and dilatations. An angulation may be viewed as a constriction, if observed in one plane. Constrictions may also be present without angulation; these usually indicate

FIG. 216
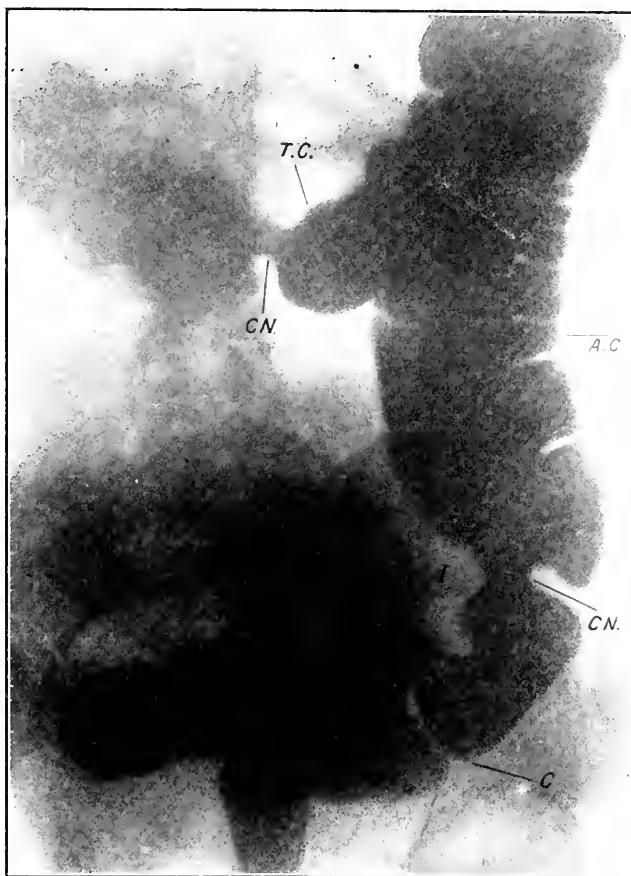
C, cecum; A.C., ascending colon; I, ileum; T.C., transverse colon. This plate is taken with the patient supine, and the plate beneath. This results in reversing the Röntgenograph. Constrictions are due to adhesions.

the presence of pronounced organic changes, which may consist of bands, adhesions, contracting scars and neoplasms. There are five locations at which angulations and constrictions secondary to contracted mesocolon and mesenteric bands are most commonly

found.   In order of their frequency they are: (1) in the upper half of the ascending colon; (2) in the sigmoid colon at the pelvic brim; (3) at the juncture of the descending colon with the

Fig. 217
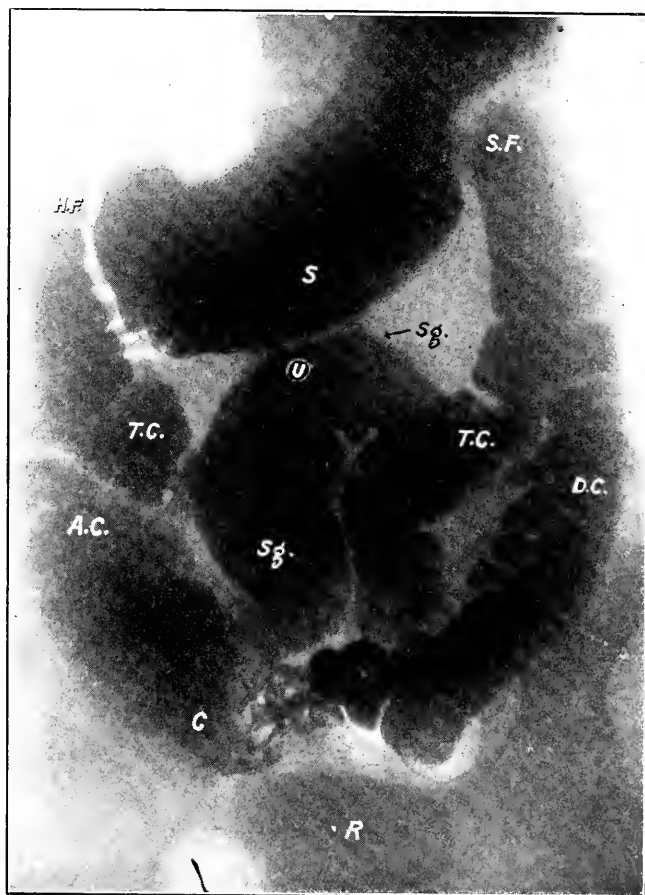
C, cecum; A.C., ascending colon; T.C., transverse colon; D.C., descending colon; Sg, sigmoid; S, stomach. This sigmoid is of unusual size, its diameter comparing favorably with that of the stomach.

iliac sigmoid; (4) at the upper end of the descending colon within two inches of the splenic flexure; (5) just above the cecum.[1]

[1] See International Journal of Surgery, December, 1913.   "Angulations of the Colon as a Cause for Serious Intestinal Disturbances."   By A. J. Quimby, M.D.

In the right transverse colon may be found angulations which can be divided into six classes: First, static or single angulation, secondary to ptosis of the transverse colon which has resulted in a

Fig. 218
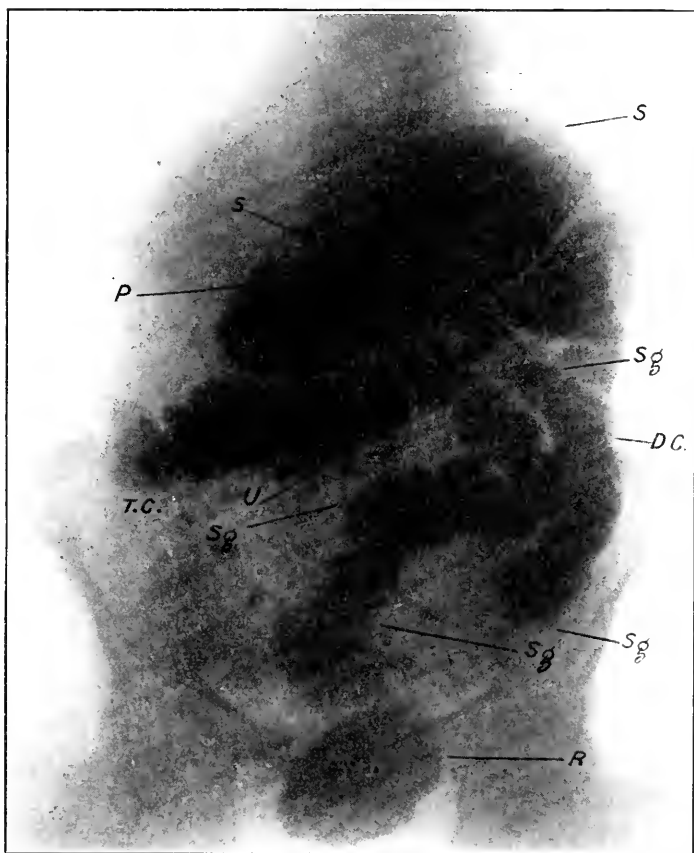
T.C., transverse colon; D.C., descending colon; Sg, sigmoid. This is an unusually large sigmoid, extending to the splenic flexure. It could be displaced downward but a short distance, being retained in the upper part of the abdomen by adhesions.

fixation of the hepatic flexure at an acute angle when the patient lies down; the upward drift of the abdominal contents being the greatest in the median line, the middle of the transverse colon is carried upward, establishing an angulation half-way between the

flexure and the middle of the transverse portion.   This can be corrected by manipulation.   The second class is organic in origin and is due to the formation of membranous and cord-like bands which bind the two limbs of the hepatic angle, and when the middle of

FIG. 219
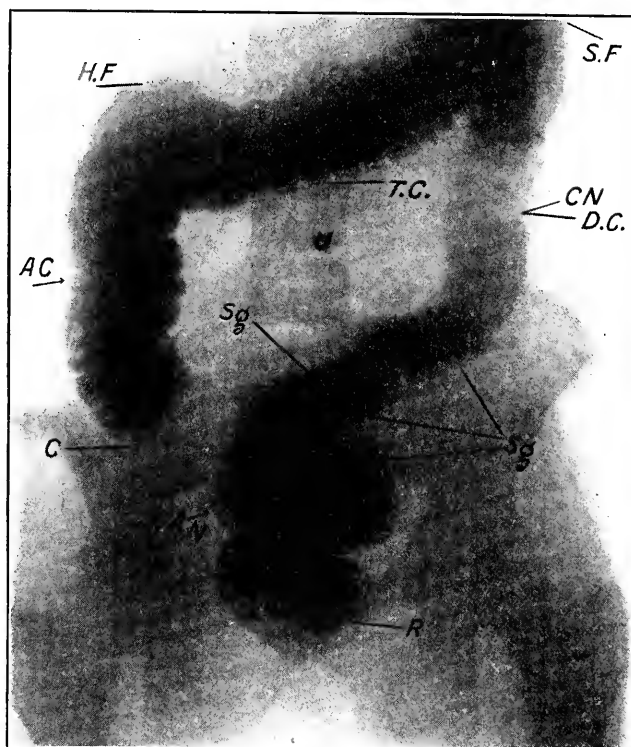
C, cecum; AC, ascending colon; H.F., hepatic flexure; T.C., transverse colon; S.F., splenic flexure; D.C., descending colon; CN, constriction; Sg, sigmoid; AN, angulation; R, rectum.   The descending mesocolon is contracted.   The sigmoid extends over to the right of the median line.   There is a moderately acute angle in the sigmoid a short distance above the rectum.

the transverse colon drifts upward, an acute angle is formed the same as in the static type; these cannot be corrected under manipulation.   The third class is due to adhesions between the transverse colon and cecum or appendix; the ascending and transverse colon can be separated one from another, but the right transverse

colon cannot be brought up out of the right iliac fossa. The fourth class is due to inflammatory adhesions secondary to gastric

Fig. 220
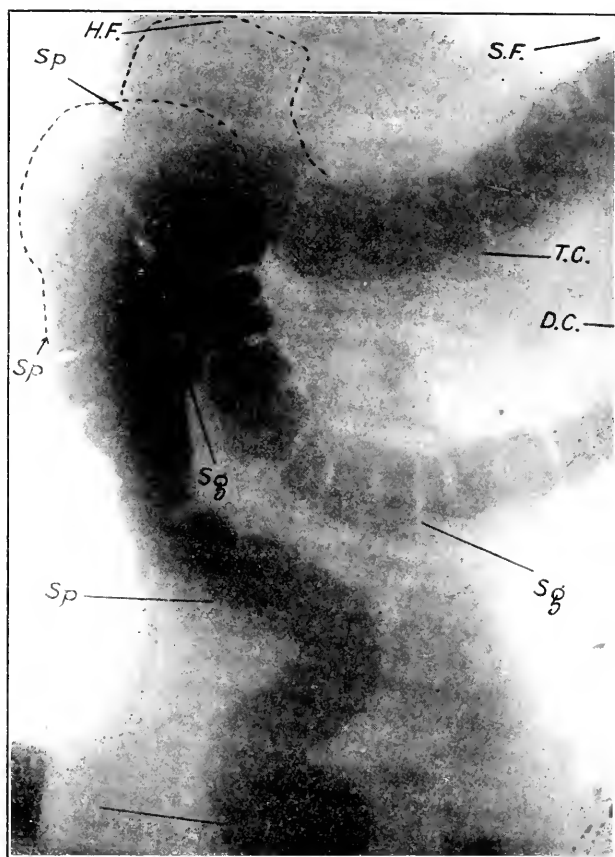
T.C., transverse colon; Sg, sigmoid; D.C., descending colon. This is taken following the administration of an enema. The patient was very large and difficult to control. The sigmoid is adherent near the hepatic flexure. Its unusual length has permitted it to drift in this position and become adherent evidently during a prolonged illness which had occurred several years previous to the examination. The history was a right-sided pneumonia following typhoid fever.

and duodenal ulcer, carcinoma and gall-bladder inflammation, and pancreatitis. The fifth class originates from postoperative adhesions; while the sixth class results in pressure of the new

growths and enlarged and displaced organs, producing pressure on the transverse colon.

The hepatic and splenic flexures are frequent locations for obstructive conditions, but obstruction at these angles is less frequent than at the above-mentioned localities, as, if careful inspection is made, an apparent dilatation or interference at these points can usually be traced to an obstruction just beyond them.

Fig. 221
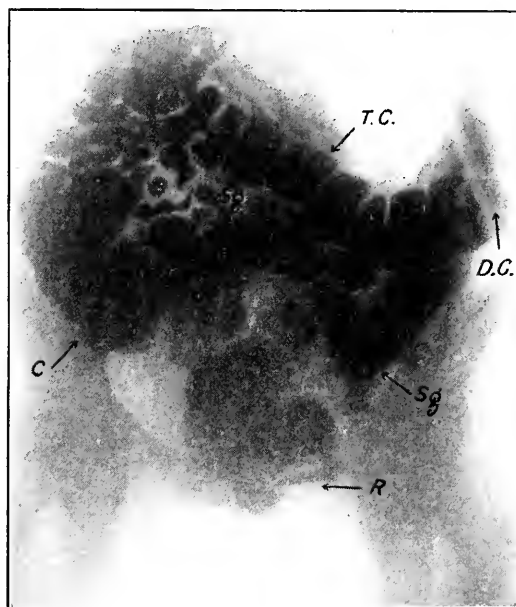
C, cecum; T.C., transverse colon; D.C., descending colon; Sg, sigmoid; R, rectum. In this case there is a large soft tumor in the pelvis, projecting upward and displacing the bismuth in the sigmoid by pressure; this is one of a stereoscopic pair of plates, a study of which permitted the localization of the tumor.

The work of Lane and Jordan has brought forward the importance of the evolutionary development of bands and adhesions which influence the function of the bowel. Of these, the mesenteric band commonly found on the outer side of the ascending colon and descending colon have become great factors in moulding the shape, mobility, and diameters of these parts. The accompanying Röntgenographs with their attached legends illustrate and describe

many departures from the normal that may be seen when the
conditions exist. They do not permit the illustration of the degrees
of mobility that may be manifested under proper manipulation
by the hand. For instance, we may take a Röntgenograph which
will illustrate the transverse colon lying well down in the abdomen.
Repeated plates will present the same findings. If the colon is

FIG. 222
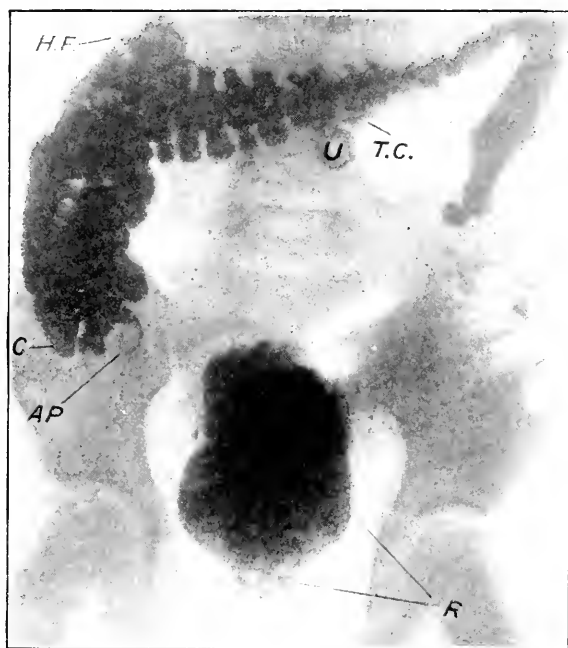
AP, appendix; *C*, cecum; *T.C.*, transverse colon; *R*, rectum. This illustrates
rectal stasis. This distended rectum could be palpated through the anterior
abdominal wall. The Röntgenograph was taken twenty-four hours following the
bismuth meal.

observed and manipulated under the fluoroscope, and great
effort is made, it may be dislodged from its position and carried
up to a normal level. That which appears to be a fixed angulation
or loop, due to adhesions, may be properly corrected and proved
to be a simple static angulation.

Should the colon be involved in an extensive mucous colitis, a
scale-like layer of bismuth may be observed clinging to the wall

37

of the bowel or apparently floating out free of the remainder of the
bismuth which occupies the clear channel.

A contracted mesentery usually results in the colonic support
becoming a fixed point, or a point of limited mobility.   If ptosis

FIG. 223
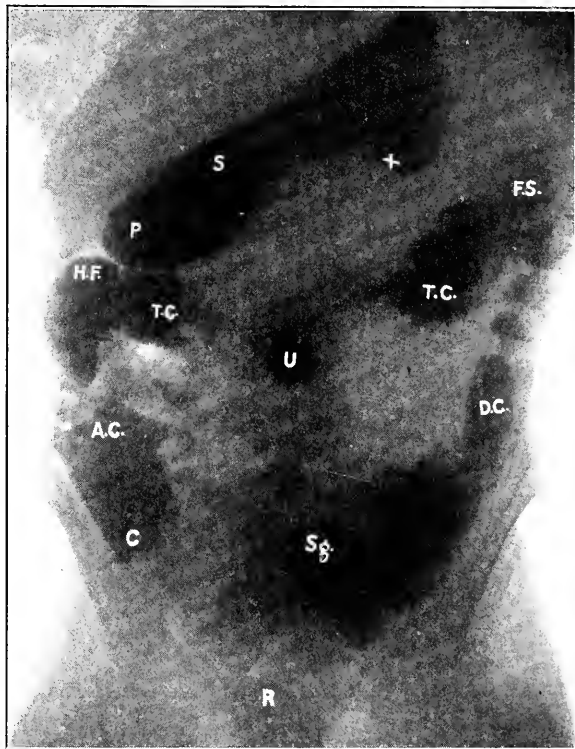
S, stomach; T.C., transverse colon.   This illustrates the displacement of organs
by a tumor.   This is a case of sarcoma of the pancreas in which the tumor has
pressed upon the stomach and transverse colon, so displacing their contents.
The Röntgenograph was taken following the administration of a meal and enema.

of the colon above or below this fixation point occurs, an angle is
formed the apex of which is at the point of most complete fixation:
the section of the bowel below drags downward, the pull depending
on the weight of the bowel and contents.   The portion of the
colon above the fixation point sags downward and overlies the

lower arm of the angle; this results in delay of the colonic contents, which usually persists throughout the day, and may move onward at night if the bowel has not undergone dilatation or formed a permanent angle.   When the patient lies down at night the

FIG. 224
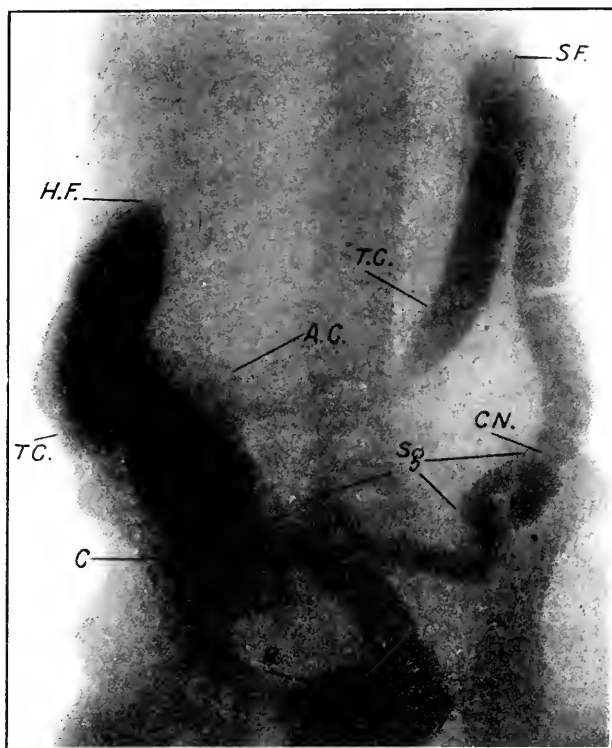
Service of Dr. F. C. Yeomans. *C*, cecum; *A.C.*, ascending colon; *H.F.*, hepatic flexure; *T.C.*, transverse colon. Displacement of the right transverse colon to the outer side of the ascending colon is due to a large tumor of the liver. It can be seen that the tumor also squeezes the enema out of the transverse colon.

simple angulations are all corrected because of the upward drift of the colon and the withdrawal of the tension on the supporting ligaments and mesentery. The hepatic and splenic flexures may be points of fixation, and as the two arms of each angle drag downward the flexure which normally should consist of a curve

becomes acute; this condition is more prone to occur from traction of the pleurocolic fold. The hepatic flexure is infrequently displaced downward. When this occurs the fixation point is usually on the ascending colon a short distance below the hepatic flexure.

Fig. 225
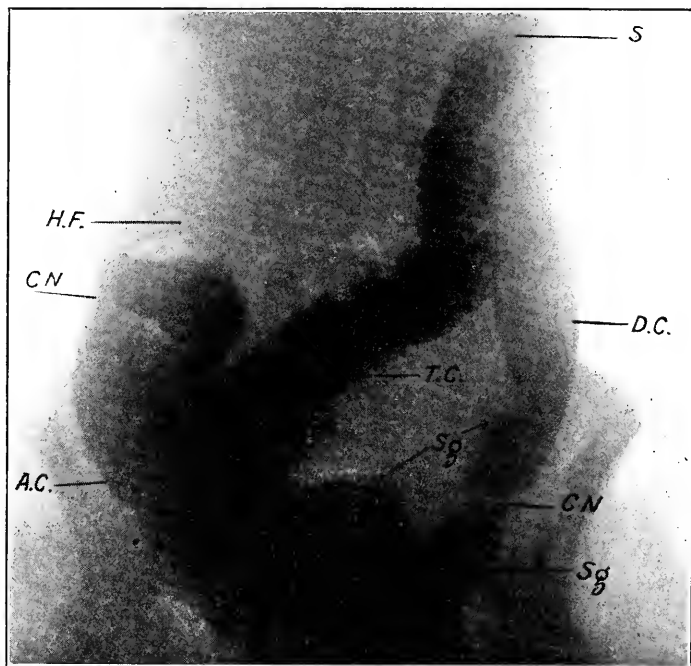
A.C., ascending colon; *CN*, constriction; *H.F.*, hepatic flexure; *T.C.*, transverse colon; *Sg*, sigmoid. On the ascending colon just above the hepatic flexure there is a constriction due to the drag on the ascending mesocolon. On the iliac sigmoid there is an annular carcinoma marked *CN*.

Stasis in the cecum is very frequent and is primarily the result of several mechanical factors. The first of these is angulation of the ascending colon or hepatic flexure, following ptosis; the cecum is frequently found in the cul-de-sac, being forced by the ascending colon to the left of the median line. The next element that enters into this stasis is the angulation of the ascending colon, when the supporting ascending mesocolon is shorter than the remainder of the mesocolon. Later in this process mesenteric

bands and adhesions intensify the obstruction and increase the stasis.

The common location for obstructive conditions is in the sigmoid: these are the result of contracted mesosigmoid, mesenteric

FIG. 226
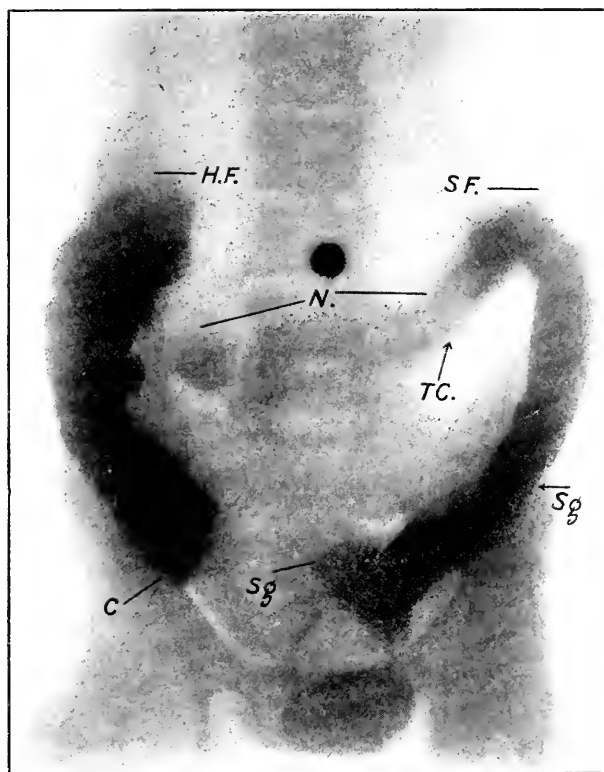
Service of Dr. Homer W. Axford. *C*, cecum; *H.F.*, hepatic flexure; *T.C.*, transverse colon; *S.F.*, splenic flexure; *Sg*, sigmoid; *N* designates the location of a carcinoma involving the transverse colon; it infiltrated the wall and at the same time permitted the bismuth to pass readily through it and give a diffused outline of the entire transverse colon.

bands, and the various pelvic inflammations. Several difficulties surround the *x*-ray inspection of the sigmoid, especially that portion occupying the pelvis, the bony walls of which prevent shifting the sigmoid about sufficiently to determine the adhesions.

Stereoscopic plates are of aid in this region, but the most efficient procedure is the manipulation of the lower abdominal contents with the patient in the knee-chest and Trendelenburg positions. A very common location for obstruction of the sigmoid is at the

Fig. 227
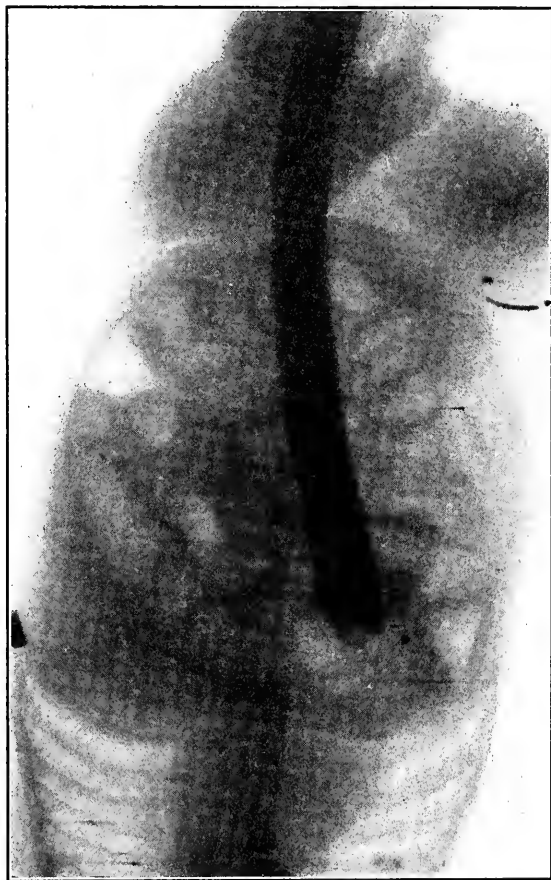
This is a Röntgenograph of a child, aged six months; it had a very long sigmoid, and upon the administration of a rectal tube the apex of the sigmoid was pushed upward almost to the diaphragm.   The tube can be seen *en route*.

level of the pelvic brim.   Acute angulations occur here because of the short mesentery which binds down the sigmoid where it passes over the brim of the pelvis.   The amount of stasis it produces can only be determined by repeated examinations

during the progress of an opaque meal. This angle can be accentuated by a distended rectum, which forces the pelvic sigmoid upward and presses the apex of the angle to the left, squeezing

Fig. 228
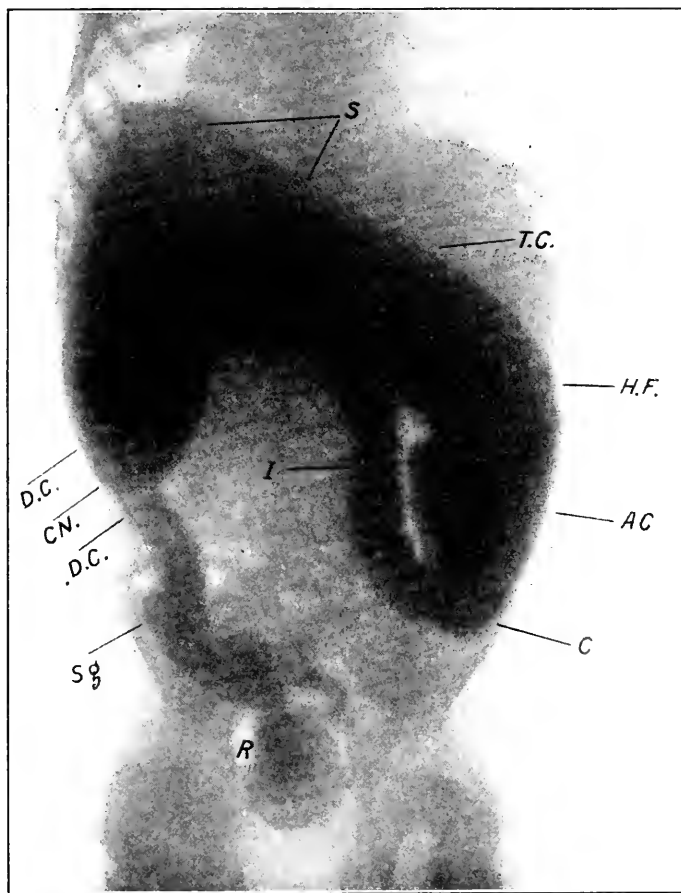
Service of Dr. E. L. Kellog. A case of megacolon. *I*, ileum; *C*, cecum; *AC*, ascending colon; *T.C.*, transverse colon; *D.C.*, descending colon; *Sg*, sigmoid; *R*, rectum; *S*, stomach. This Röntgenograph is taken following the administration of a meal and enema. The enema has passed into the ileum. The stomach is the elevation riding on the top of the left transverse colon. The stricture that has produced the dilatation is in the lower half of the descending colon.

it against the bony wall. Distention of the rectum by an enema may establish this obstruction primarily, as has been witnessed by the writer.

INDEX.

Lynch, Jerome Morley, 1870-
 Diseases of the rectum and colon and
their surgical treatment, by Jerome M.
Lynch. Illustrated with 228 engravings
and 9 colored plates. Philadelphia, New
York, Lea & Febiger, 1914.
 ix, 530 p. front., illus., col.
plates. 25 cm.